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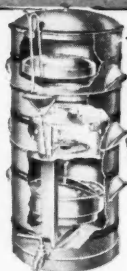
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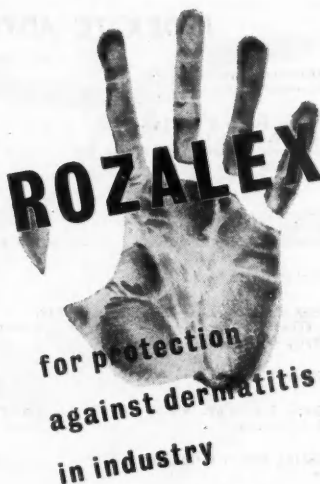
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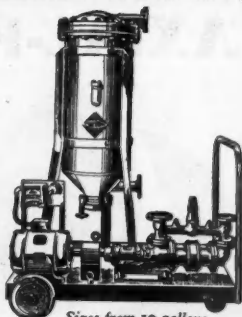
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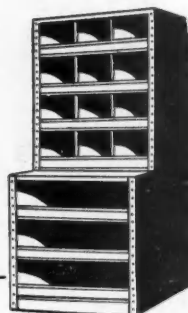
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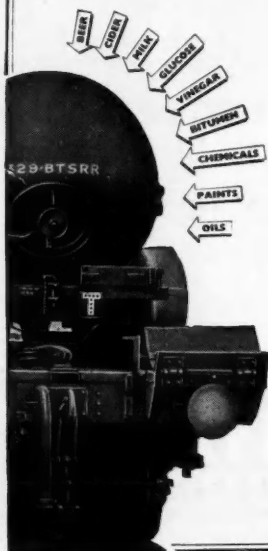
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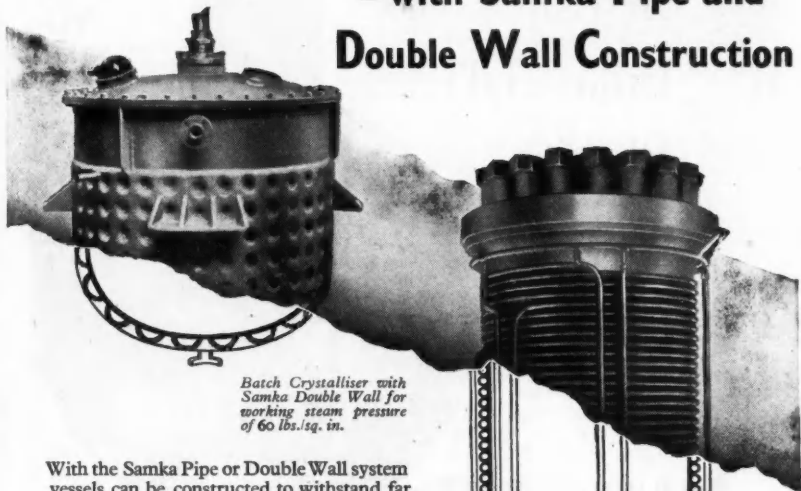
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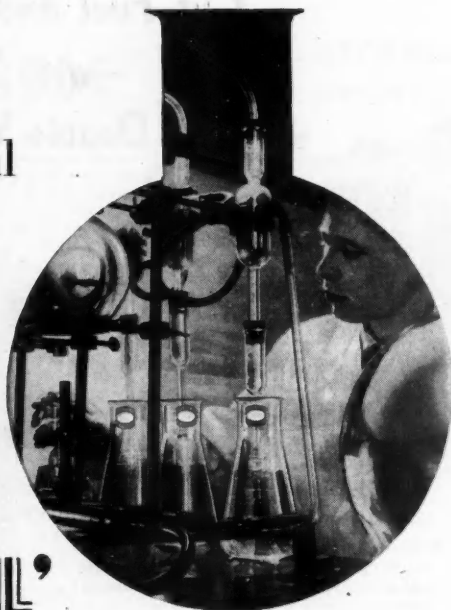
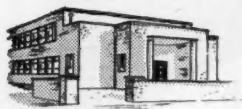
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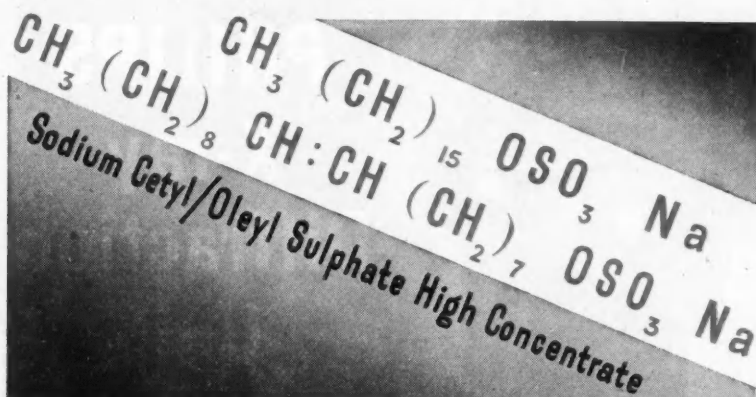
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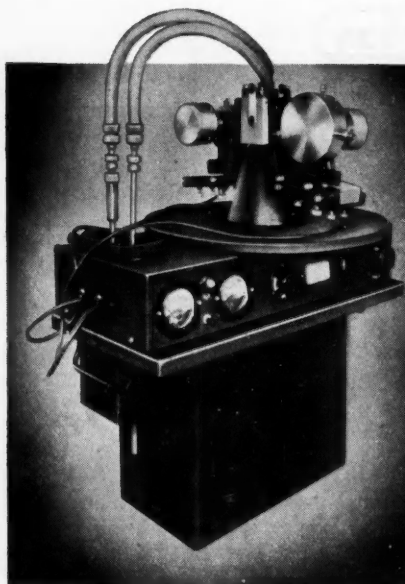
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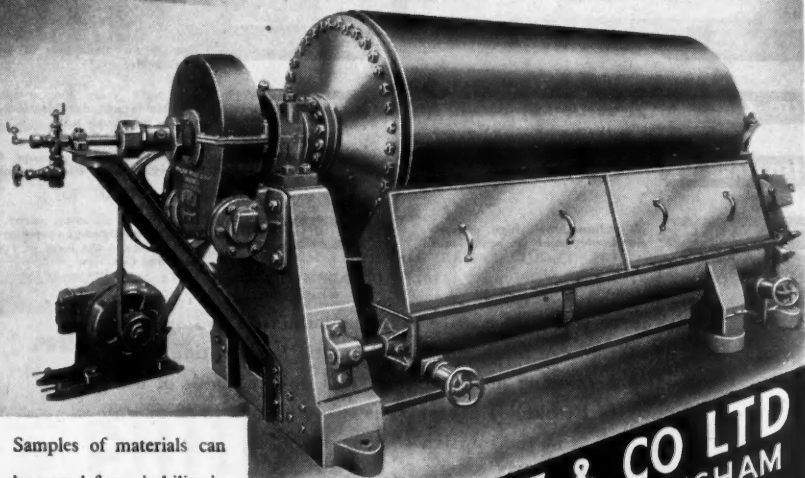
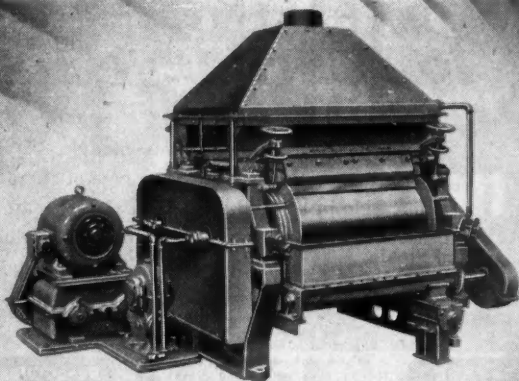
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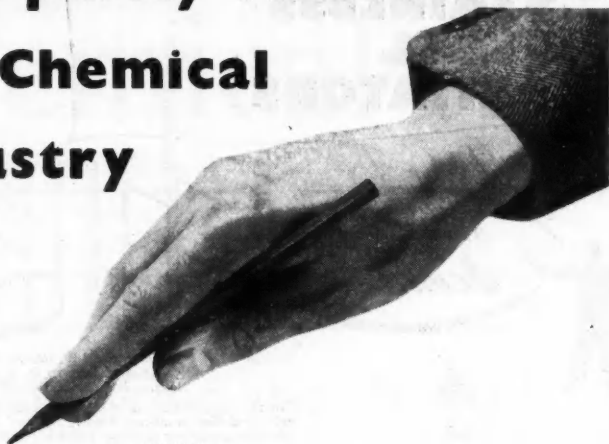


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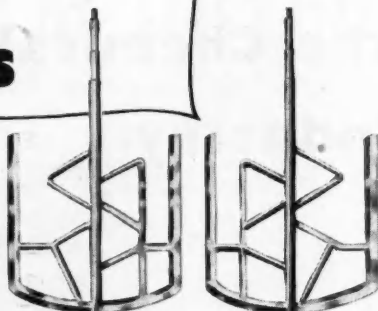
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Volume LXIII

9 December 1950

Number 1639

Attacking the Tower

IN his speech at last week's annual dinner of the Royal Society, the new president, Professor E. D. Adrian expressed some concern about scientists becoming unintelligible to one another. Science was building a "Tower of Babel" and he laid some of the blame for this upon the paper shortage. "If you are bubbling over with information and have to get it all into half a column, it is a great temptation to speak of Compound E when what you really mean is 17-hydroxy-dihydrocorticosterone," he said.

There must be many laymen who found this comment somewhat puzzling though they may also have derived a little satisfaction in learning that an age-old external problem of science—unintelligibility—has begun to manifest itself internally. This modern custom for replacing complex chemical names with simpler contractions is a stride towards better and easier understanding. It is surely a minor consequence if a small number of scientists would appreciate the meaning of a sentence that spoke of 17-hydroxy-dihydrocorticosterone more rapidly than one that spoke of Compound E; and this disadvantage is remedied easily enough by looking up the more precise name and formula for the substance. Indeed, if it is the

paper shortage that has encouraged this tendency, then a very ill and long-suffered wind in our way of life has produced at least one benefit. But, in fact, the drive for shorter and simpler names has been most powerful in the United States, a country where paper is lavishly abundant.

Clearly Professor Adrian fears the invasion of scientific literature by these popular substitutes for proper names and terms. There is undoubtedly some danger that precision and accuracy will be gradually eroded. Two safeguards can avoid these consequences. First, there should be an internationally agreed list of names to ensure that they are properly used *e.g.*, to ensure that DDT will be used only for dichloro-diphenyl-trichloro-ethane. Second, in all scientific papers the first use of the contracted name should be followed with the bracketed or foot-noted presentation of the precise chemical name. If these two conditions were always applied, it is difficult to see how any disservice will be done to science and its clear exposition.

Today it is possible for one complex organic substance, or a related group of such substances, to become the foundation of a new branch of applied science and chemical manufacture. It

is essential to make verbal compromises. Innumerable people must refer to the substance or substances very frequently and no more than a handful of them will be organic chemistry linguists brought up on a diet of structural prefixes and suffixes. The chemical engineer will often have an important part to play in the production of such materials and even he will shrink from di-, tri-, para-, and ortho-symphonies. Let it not pass unnoticed that even chemists have had to compromise among themselves. In the example just quoted, dichlorodiphenyl-trichloroethane is a deplorable contraction for α -bis-(*p*-chlorophenyl) - β - β - β - trichloroethane. Professor Adrian spoke of a "Tower of Babel," but there is a more refined quota of unintelligibility within that older tower of science, the Ivory Tower. It is true that Compound E is a popular term without self-evident meaning to the organic chemist; but when properly used it enables more people, including doctors, to read literature about it without mental discomfort. Centuries ago Hippocrates observed that "if you miss being understood by laymen, you will miss reality."

No one would deny that the introduction of easier names presents new

problems. One is the difficulty in distinguishing between such names and trade-names. In the modern insecticide industry the rapid development of a number of synthetic chemicals has created several confusions of this kind. In America, benzene hexachloride is BHC; when produced with a high content of the gamma-isomer the name "lindane" is now used. Here the trade-name "Gammexane" has frequently been used for benzene hexachloride or BHC, and now, when the more refined gamma-product is also available, "Gammexane" is still tending to be used. So long as this source of confusion is confined to commercial literature, little harm is done; it begins only when the same twofold meaning slides into scientific literature. Yet the remedy is easy enough. The scientists writing for other scientists can avoid the use of the trade-name and use the full chemical name or the more widely accepted contractions, BHC and lindane. A trade-name is not created for scientific purposes.

The danger of a "Tower of Babel" was greater in the early period of finding shorter names for organic synthetics. The fashion for letter combinations and numbers can now be

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Chemistry at the Festival

SCIENCE will play a major part in the displays at the Festival of Britain Exhibitions; in particular chemistry will get a very good showing. Both in terms of fundamentals and of industrial products, British contributions to this science will be made manifest in a luxuriant diversity of ways. In a recent interview with a group of science writers, Mr. Cox, Science Director of the Festival, outlined something of the basic ideas, content and methods of the scientific displays.

At the South Bank site—the best known of the Festival's Exhibitions—two principal "circuits" have been laid out, based on "The Land and the People." In the former, displays of the geology and the natural resources of the land will lead naturally into a pavilion devoted to our manufacturers. Here, examples from the rich range of British chemical products will be displayed alongside those of other industries. Meanwhile in the agricultural sections our pioneering researches in the applications of synthetic fertilisers will be shown rounded off by a photomontage of a modern phosphate factory. Here too, the contribution of selective weed killers to our rising agricultural productivity is illustrated by reference both to the hormone and the "straight" type of agent. In the massive central Dome of Discovery, which tends to dominate this part of the site, is evidence of British discovery in theory and practicability. Models portraying the atomic theory will have their practical counterparts in the displays of dyestuffs, photography, plastics and the uses of the rare gases. British industry has contributed much and pioneered widely in the internationally cross-fertilised field of chemistry. Here a part of the story is told—but gracefully, without stridency and with due acknowledgement of contributions in all parts of the world

which we have helped and which have helped us.

Teaching Fundamentals

AMONG the many assets which will remain with us after this eventful Festival, will be the enormous strides in educational methods which have resulted from special researches in this field. The devices employed to capture and sustain attention, and to drive home points to the most apathetic are powerfully compelling. In the Science Section at South Kensington, housed next to the Science Museum, there is (for example) a unique presentation intended to show relative levels of the analysis of matter. Theme for this show is an ordinary so-called lead pencil. In a sequence of four rooms, visitors are led into an Alice-in-Wonderland illusion of growing smaller until they are of sub-atomic size. At this stage, they can meet atomic models so to speak as equals, the visitors having diminished in size by a factor of roughly 10^{10} . What does this mean in terms of chemical and allied fundamentals? At the stage of one-tenth reduction, in the first room, they merely see a pencil enlarged; in the second room, they see only the tip a thousand times, enlarged, but in the third they begin to learn the crystallography of graphite, for here the characteristic layer structure is shown in the way the trace is made on the paper. At the 10^{10} stage wave mechanic models take the visitor into a deep understanding of the intra-atomic structure. And throughout, in a blended, unified whole, sound and surroundings are combined to create this valuable didactic illusion. Truly, a new generation should emerge from displays like these, one grounded in basic physics and chemistry and fully able to appreciate the achievements of the chemical industry.

Zinc Rationing in 1951?

EVIDENCE of the increasing shortage of non-ferrous metals is afforded in the announcement by the Ministry of Supply on November 29 that consideration is being given to an allocation scheme for virgin zinc in the new year. The Minister of Supply, Mr. G. R. Strauss, in reply to further questions, told the Commons on December 4 that "a statement on the supply position will be made shortly."

At present the allowance to consumers has been cut to 90 per cent of their 1949 deliveries, which, based on current consumption represents a reduction of about 25 per cent. When this cut was first made, on October 1, some consumers of zinc, had already used 90 per cent of their 1949 deliveries and, in effect, were not entitled to further supplies this year, although certain concessions have since been made.

It will be remembered that an announcement from the U.S.A. in November indicated that U.S. stocks of zinc are now the lowest for 25 years, although domestic output is the highest since 1944. Meanwhile, the U.S. Government has stated that civilian consumption of zinc is to be cut by 20 per cent in January 1951.

New Industrial Chemical

CROTONALDEHYDE is a clear, almost colourless liquid with a sharp, penetrating odour. It has a boiling point (760 mm.) 84-85° C., and a flash point 66° F., the freezing point is -75.9° C. The aldehyde is soluble to a limited extent in water, but insoluble in most common solvents, such as ethyl alcohol, ethyl ether and benzene. Crotonaldehyde is itself a valuable solvent and readily dissolves vegetable and mineral oils, varnishes, shellac, resin, waxes, synthetic resins and rubbers.

As a member of the reactive aldehyde family, and containing a conjugated double bond system, crotonaldehyde is an important intermediate finding use in the synthesis of many organic chemicals, synthetic resins, dyestuffs and latterly the man-made pyrethrins. The following are the most important developments in this field:—

(1) Oxidation of the aldehyde produces crotonic acid or maleic acid used in alkylid resins.

(2) Reduction of crotonaldehyde gives n-butyraldehyde needed for the synthesis of butyric acid or higher alcohols by the aldol condensation. Butyric acid is assuming importance as raw material for plas-

tics manufacture, e.g., cellulose acetate butyrate.

(3) Condensation of the aldehyde with aromatic amines gives a wide range of potentially important chemicals, some of which are finding use as rubber vulcanisation accelerators, synthetic resins and substituted quinolines.

(4) Crotonaldehyde is recommended as a denaturant for alcohol and as a warning agent in detecting gas leaks.

(5) In the processing of lubricating oil the aldehyde is finding some use as a special solvent to remove resinous or gummy impurities.

Crotonaldehyde is a dangerous chemical owing to its inflammability and active lachrymatory character. Painful blisters are formed when the liquid comes in contact with the skin.

ATTACKING THE TOWER

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seen as a regrettable mistake. DDT and BCH enjoyed a short period of isolation in their own field; then came HETP and TEPP, MCPA, 2,4-D, DD, etc. Even wartime and post-wartime organisations were not more alphabetical. It is essential that a familiar contraction should be easily memorable and the more recent fashion for coining new and fairly fluent names is a great improvement. For example, cortisone is very much better than Compound E; and allethrin, the name coined in U.S. for the synthetic analogue of one of pyrethrum's constituents, is much superior to any combination of letters or numbers. The pronounceable name will make its mark in the memory; innumerable combinations of letters or numbers require directories.

For so many purposes it is convenient to make use of these simplified names. The tide cannot be turned back nor can a sharp frontier between popular and scientific usage be set up. International agreement at an early stage in the development of a new and possibly important substance is required as a safeguard against confusion. But protracted debates on and between innumerable committees to decide which is the most suitable of several names should be avoided; a rose by any other name would smell as sweet.

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METHODS OF ESTIMATING MOISTURE

Following is a summary of a paper presented by Alan H. Ward, B.Sc., A.R.I.C., to The Institute of Fuel, in London on Tuesday, 5th December.

"MOISTURE content" would appear to imply a most elementary analytical determination, although in practice it may well be one of the biggest sources of disagreement between different laboratories. This arises from the complex relation between water and the substance with which it is associated. Free moisture is normally present in all materials but in addition water may also be adsorbed or otherwise physically bound to organic substances, particularly colloids. Furthermore, the elements of which water is composed, namely hydrogen and oxygen, are components of the main organic constituents of matter—carbohydrates, protein and oil. Thus, when assessing moisture content, one has to take into consideration water in three separate states—free or surplus moisture, physically bound moisture and the chemically combined elements of water.

Roughly the Same Properties

Except in the presence of relatively large amounts of soluble material, free moisture has roughly the same properties as ordinary water as regards vapour pressure, boiling-point, etc. Adsorbed moisture is quite different. Its vapour pressure is markedly lower and colloids will not part with all their moisture when heated to temperatures well over 212°F. or when subjected to desiccating agents or to vacuum treatment.

The chemically combined elements of water can, of course, only be driven off when actual decomposition occurs. With most organic materials, other than pure substances, there is no definite temperature at which decomposition begins. It merely proceeds at different rates with different temperatures; $302^{\circ}\text{--}329^{\circ}\text{F.}$ would be sufficient to decompose most foodstuffs at a fairly rapid rate, but some decomposition occurs at lower temperatures than this.

Consequently, if an organic colloid system is subjected to increasing temperature there will be a complete release of the free moisture, a fairly gradual release of physically bound moisture and simultaneously a gradual but increasing loss by decomposition. At the same time there may be a loss of other volatile substances. One cannot fix definite conditions under which

all moisture is evolved without decomposition occurring, and thus no figure strictly representing moisture can be reported. Moisture content must therefore be regarded as a relative expression and must be qualified by a definition of the testing conditions.

These difficulties, however, are not as serious as might first appear. The objects of determining moisture are primarily for policing purposes, either of a material or of a process. Moisture content is not really significant in itself but only for comparison with other consignments of similar nature. The main purposes of the moisture test are:—

1. *To obtain "real value."*—Generally speaking, the value of a commodity is inversely related to its moisture content.

2. *To ascertain keeping quality.*—Most materials, particularly foodstuffs, have a critical moisture content" beyond which their storage life markedly decreases. This renders them liable to more rapid deterioration, the development of taints and attack by bacteria and mould.

3. *Process control.*—Manufacturers naturally wish to produce a consistent material sufficiently low in moisture to undergo safe storage yet whose moisture content is not at an unduly low and uneconomic level. For instance, if the raw material were received at 20 per cent moisture, one would not wish to sell the product at 5 per cent.

4. *To decide the nature and degree of processing.*—In the flour-milling industry, for example, wheat going to the mill may contain up to 25 or 30 per cent moisture and this has to be dried down to approximately 15 per cent. The treatment given to this wheat will vary according to its original moisture content, not only as regards the total amount to be removed but also as regards the temperatures and times of drying. These must be modified for different moisture contents in order to avoid damage to the grain and consequently to the baking quality of the flour.

The Economic Factors

5. *To decide whether a material is worth processing at all.*—In dehydration processes, the economy of drying is highly dependent on the original moisture content of the raw material and the difference

between 85 and 90 per cent moisture here may make all the difference between profit and loss. At 85 per cent moisture one has to evaporate roughly 103 cwt. of water to obtain 1 ton of dried material (at 10 per cent moisture content), whereas at 90 per cent moisture 164 cwt. of moisture must be removed for a similar weight of product.

6. *To meet the requirements of legal statute or recognised trade practice.*—In the Wheat Act, for instance, it is necessary to declare the ash content of wheat offals on a 12½ per cent moisture basis, and this obviously requires a determination of moisture on the material leaving the mill.

Thus it is obvious that the true moisture content is not of any real significance. An arbitrary but established and reproducible method of testing is satisfactory if it is recognised as applying to the material in question, thereby making all results thoroughly comparative.

Not Usually Difficult

Sampling of reasonably dry materials is not normally difficult, except possibly in cases where further grinding is necessary, as during this process any heat developed may lead to some loss of moisture. In cases of this kind some small moisture loss is almost inevitable, except where such accuracy is required as to make stringent precautions necessary, but with normal care the samples can be satisfactorily and safely processed.

Greater difficulties arise* where moisture contents are high particularly when they exceed 20 per cent. With materials like wet grass, fruit and vegetables preliminary drying is essential in order to obtain an even sample, as it is practically impossible to draw a representative 5 g. or 10 g. from a sample having the heterogeneous nature of silage or green crops, for instance.

With any wet material the recommended procedure is a "double stage" moisture determination in which the first stage is intended to dry a bulk of the sample to approximate equilibrium with atmosphere. At this stage the material can safely be sampled down and ground to obtain a laboratory sample of uniform composition.

A suitable weight of sample should be immediately weighed and if necessary shredded to a convenient size. This sample should be dried by any appropriate method, preferably by freezing and vacuum processes, or by slow or rapid air-oven drying, according to the nature of the material. Care must be taken to ensure that the other constituents of the material are not adversely affected by the treatment.

Thus, when drying wet grass it is

advisable to use the quick freezing and vacuum process in order to conserve carotene; failing this, if hot air is used, drying should be conducted as rapidly as possible because high-temperature/short-time drying leads to less destruction of carotene than longer time at a lower temperature. Conversely, when drying wheat that is ultimately to be used for milling, low-temperature drying is advisable in order that the gluten (protein) shall not be affected in its physical quality.

When drying has proceeded sufficiently the bulk sample is allowed to stand exposed to air while cooling. Any gain or loss during the cooling stage makes for closed equilibrium. When cool, the sample is weighed and can then be safely subsampled and ground, with due observance of all the precautions necessary for a normally dry material. A moisture test on this semi-dried sample allows the total moisture content to be determined according to the formula:—

$$\text{Percentage of moisture} = a + b - \frac{a \times b}{100}$$

where *a* and *b* represent the percentage moisture obtained in the two stages of the process.

Methods of estimating moisture vary considerably. The commonest method is heating in an oven, but there are methods of distillation, titration methods and others involving chemical processes, for example, evolution of acetylene from carbide. A few depend on the physical properties of water, such as depression of the freezing-point, or heat evolved when various chemicals are added. The most recent developments in this direction have produced types of electrical recorders which take advantage of the greater conductance of water compared with the medium in which it is contained. The chemist thus has a wide range of methods from which to choose that best suited to his particular conditions.

Variety of Techniques

There are many types of drying ovens and a wide variety of techniques for their use. The principal refinements lie in the use of vacuum apparatus or incorporating an atmosphere of inert gas.

The temperature, time of drying and the construction of the oven all have an important effect upon the final results. Temperature is the main factor controlling the amount of bound moisture that is evaporated, and strict accuracy of temperature control becomes of paramount importance particularly with low-temperature ovens. As little as 1° F. variation in temperature

can markedly affect the result with ovens working at approximately 212° F. This type of oven is also liable to considerable variations in temperature in different parts of the drying chamber unless the apparatus includes some form of ventilating fan. Inadequate ventilation may lead to differences in relative humidity from one batch to another.

The use of vacuum ovens will largely overcome these difficulties but tends to retard drying because of reduced convection and conduction of heat in the evacuated atmosphere. It may also increase the loss of other volatile matter.

Air ovens working at higher temperatures are not as susceptible to temperature variations as those working at about 212° F., but there will be increased loss of volatile substances and there may well be partial decomposition such as occurs in ovens working at 302° F. or above.

Where the material contains drying oils there may be a substantial increase of weight by oxidation; such materials as linseed and its products cannot be dried satisfactorily in an oven except in an inert gas atmosphere or by the use of vacuum.

As a rough guide, the following table shows the differences between several accepted oven methods of determining moisture (as applied to wheat products). It indicates an overall range of more than 1 per cent moisture over a temperature scale of 108° F.

Temperature (°F.)	Time	Moisture differences (per cent)
208.4	5 hr.	—
212	5 hr.	-0.7
230	4 hr.	+0.2
239	4 hr.	+0.4
248	2 hr.	+0.4
311	15 min.	+0.5

Nevertheless, the air oven provides the most popular and useful method for routine estimations except where very speedy results are required. This is partly due to the fact that it is easily adapted for rapid routine tests and does not make any great demand upon skilled chemists. One operator can easily perform over 100 separate moisture determinations when provided only with an oven of suitable size, an accurate air-damped balance and a desiccator. The method is ideally suited for factory control work in the hands of a semi-skilled operator. There is very little that can go wrong and cost of upkeep is low.

Common Oven Methods

Some of the most common oven methods include:—

1. The Water Oven at Approximately 210° F.

This is the least satisfactory oven drying method, as in practice the temperature inside the oven may be as low as 208° F. or as high as 211° F. Conditions vary according to altitude, as the boiling-point of water is affected by the barometric pressure. Furthermore, a low temperature implies a long drying time, which should never be less than 5 hr. and may be as much as 12 hr., particularly with materials that are not in a fine state of granularity. In view also of the small size of most water ovens the throughput is necessarily less than that of ovens working at higher temperatures.

2. The Air Oven at 212° F.

Usually this is electrically operated, and a properly thermostatically controlled and ventilated oven should maintain a uniform temperature. Here again, however, the disadvantage is the lengthy period of drying, which still must be in the region of 5 hr. This method of heating for 5 hr. at 212° F. is in fact the official method prescribed by the Wheat Act and other legal statutes, but in practice many analysts use less tedious processes and apply a correction factor to obtain the standard figure.

A Satisfactory Method

3. The Air Oven at 221° F.

This is one of the most satisfactory methods for routine control, in spite of the fact that it does not remove all the physically bound moisture. The temperature is sufficiently high to cause rapid drying and yet is not so high as to lead to the loss of much volatile matter, or to any appreciable decomposition. For most substances, 3 hours' drying is quite sufficient, and in fact there is very little difference between the results of tests extending over 2 and 3 hr. A large electric oven will hold as many as 50 samples, and one operator can easily manage the preparation, drying and weighing of three batches, totalling 150 samples, per day. For this purpose, of course, the sample containers should preferably be all of substantially the same weight and counterpoised on the balance, so that weighing can be made extremely rapid.

4. The Air Oven at 230° or 236° F.

This also is a popular and satisfactory routine apparatus for moisture determination. The samples may be dried for 2, 3 or 4 hr., and results are normally about 0.2 to 0.5 per cent higher than those given by the standard method of 5 hr. at 212° F. Even at 239° F. very little decomposition occurs with most materials, and under the conditions of the test most of the physically bound moisture should be released.

5. The Air Oven at 248° F.

Heating may be for either 1 or 2 hr.; 1 hours' heating gives a result approximately equal to the standard method, and with 2 hr. the figures are about 0.5 per cent higher than the standard. This technique seems to have little advantage over 230° or 239° F., as the higher temperature, while giving little economy in time, is approaching the range where decomposition commences. This method and all those previously given are essentially batch methods, and there is no real point in obtaining a drying time which is less than that taken by the operator to prepare the next range of sample and weigh off the previous batch.

6. The Brabender Oven at 266° F.

This German machine incorporates a novel device whereby the dishes are placed on one arm of a balance and can thus be weighed while still hot in the oven. While this arrangement has certain advantages in decreasing the number of manipulative operations, the method seems to lack real accuracy owing to convection currents within the machine and also the limited accuracy of the spring balance mechanism. The method operates over a drying period of 1 hr.

7. The Carter-Simon Oven at 301° F.

This process differs from the foregoing in that it is a continuous process operated for a short drying period. The oven is an electrically heated tunnel with hinged doors at either end. It is so constructed that it holds three samples; a sample is pushed through the inlet side every 5 min., displacing a dried sample at the outlet. Each container has exactly 15 min. in the oven, and the operator has 5 min. in which to weigh off each dried cooled sample and weigh on the next sample.

Although the throughput is not as high as in some of the batch methods previously described, it is a very convenient method where a reasonable but not very large number of samples has to be tested. In spite of the short time of drying the high temperature leads to results about 0.5 per cent higher than with the standard method, mainly owing to the removal of most of the bound water, but also partly because of some decomposition.

No Specific Time

8. The Chopin Laboratory Tester at 392° F.

The novelty of this apparatus is that drying is not for any specific length of time. The sample dish is placed within an electrically heated element in such a manner that the issuing water vapour passes through a tube of calcium carbide, giving forth a stream of acetylene, which

is ignited; the sample is removed as soon as the flame decreases to a specified height. Owing to the high temperature used, considerable decomposition takes place and results are 0.5 to 1 per cent higher than by the standard method.

The main disadvantage of this method is that the construction of the apparatus allows only one sample to be tested at a time. However, each test only takes about 6 min. and there is no necessity to grind the sample to a fine state of division. Such materials as whole wheat and barley can be satisfactorily tested by this method. This is most useful where rapid results are required on a few samples, and particularly where these would require grinding before testing by conventional oven methods, as, for instance, with wet wheat or other grains.

Vacuum methods of drying normally consist of an adaptation of the ordinary air oven, and they work at approximately 212° F. Under these conditions there is a rapid initial loss of moisture, but vacuum treatment does not give the extremely quick drying that might be expected. Exclusion of air interferes with heat transfer because convection currents are absent and many organic materials are of low conductivity.

Pressure Remains Same

The vapour pressure of the water in the sample remains, of course, the same as it would be under normal atmospheric pressure. Even though the chamber is evacuated it does not follow that water vapour in contact with the sample will be removed very quickly, especially when one gets down to low moisture contents after the initial stage of drying. This particularly applies since the recommended procedure for vacuum oven methods is to leave the lid of the container loosely on the dish, so as to prevent dispersal of fine particles of the test material.

In theory, the right principle would seem to be alternate evacuation and release of dry air into the apparatus, so that any remaining moisture vapour would be rapidly swept out with each successive charge of air. Failing this, the material should first be heated at normal pressure, so that the application of vacuum will draw away the water vapour along with the air.

Vacuum ovens have definite advantages with substances that are liable to oxidation by air as, for instance, linseed products. On the other hand, they have definite disadvantages when the test material contains an appreciable proportion of volatile matter, e.g., many oils, some

sugars and esters. In general, vacuum methods utilising high temperature will give higher results than conventional oven methods working at normal pressure, the difference being as much as 1 to 2 per cent in many cases.

On the other hand, the use of low-temperature vacuum methods has much to recommend it when great accuracy is required at the expense of speed. The method of De Bruyn, using a high vacuum at 100° F., has been found to give accurate moisture figures unaffected by any loss other than moisture.

For this purpose it is important to obtain as large a drying surface as possible, and in one ingenious modification the material is placed in an inclined and rapidly rotating flask under high vacuum, so that the sample is in effect spread in a thin layer over the whole interior surface of the flask, giving much enhanced evaporative surface.

Recent Developments

More recent developments utilise extremely low temperatures and high-vacuum treatment, a procedure eminently suitable for very wet matter and one which renders negligible the possibility of decomposition. The method seems very well suited to a large number of biochemical assays in which it is desired to dry the test substance without impairing its content of vitamins, for instance. In most laboratories these low-temperature methods are ruled out because of the lack of facilities for very high vacuum and for the necessary low-temperature control.

There are a number of modifications of the method for the direct distillation of water, particularly from materials having a higher moisture content. They are all similar in that the sample is treated with an immiscible liquid such as oil or hydrocarbons. In some methods the liquid is volatile, in others it is not. The principle is that with increasing temperature the water is distilled from the test sample, is condensed and collects into a graduated side tube where its volume is measured.

The original method of Dean and Stark uses a volatile liquid which distills over along with the water, but, being lighter, forms a supernatant layer which is arranged to flow back into the sample flask. Xylene, benzene and toluene have commonly been used as the solvents. The methods are fairly accurate and avoid many of the complications experienced with very wet materials; but normally they estimate only free moisture, and not that physically bound in the material. Furthermore, since most of these solvents

are inflammable, there is a certain element of danger unless the operator has some degree of manipulative skill.

The Brown-Duval and its modifications use higher boiling-point liquids, such as mineral oil, in place of the more volatile hydrocarbons. The principle is the same as with other distillation methods, except that the water distills fairly pure. Even though the temperature utilised may go up to 356° or 392° F., it would still appear that only part of the bound moisture is removed, and the recorded moisture figures are normally lower than with the conventional oven methods.

Theoretically, a large number of methods of estimating moisture by chemical means would appear possible, in view of the large number of reactions in which water plays a specific part. In practice, however, few of these have been proposed and only one or two have achieved prominence, mainly owing to the difficulty of ensuring (i) that complete reaction takes place, and (ii) that it includes the physically combined moisture present in test materials.

The most popular method is the direct titration technique using the Karl Fischer reagent, in which water is extracted by the use of a dry miscible liquid such as methyl alcohol. To this is added excess of a mixture of iodine and sulphur dioxide in pyridine, the two reagents reacting with water to produce, in effect, hydriodic acid and sulphurous acid. The purpose of pyridine is to combine with these products and prevent any undesired reversible reaction.

Excess reagent is back-titrated with a solution of water in methyl alcohol until the colour changes from brown to yellow, indicating that all the iodine has been reduced.

Careful Standardisation

The method requires careful standardisation of the reaction solutions, granularity of the test substance, and the time of reaction. Under reproducible conditions, however, the method gives satisfactory results that duplicate well, but the figures are usually below those obtained by oven methods. It has the great advantage that in a properly organised laboratory a great many samples can be tested rapidly and that a minimum of apparatus is required. The procedure is no more complicated than any ordinary chemical titration.

Although the method would seem ideally suited for materials of very high moisture content it has the inherent disadvantage that only small amounts of water can be

titrated, the total amount being of the order of 0.1 to 0.2 g. Thus with a sample of even 20 per cent moisture content, not more than 1 g. of sample can be tested; this necessarily raises difficulties in obtaining an even and representative sample.

Another chemical method with fairly wide application takes advantage of the reaction between water and calcium carbide to form acetylene. There are several modifications of this, but the principle is that the carbide evolved is measured either volumetrically or by pressure. While the method gives reasonably satisfactory results for substances containing only free water—as, for instance, coal and many inorganic materials—it gives low and erratic results with many organic materials where bound water is present or when the material is not finely ground. In a series of tests on wheat and wheat flours, results obtained by this method have been found to be about 4 per cent too low. In the author's experience, results on grain ranging from 10 to 30 per cent moisture are so erratic as to be useless.

The methods previously described are essentially suitable for the analyst or the works chemist in the factory laboratory, but hardly adapted for use in the factory itself. They require at least a semi-skilled operator, one also who is more or less completely engaged on the task. Even the quickest of these methods is fairly time-consuming and results would not be obtained in less than 15 minutes, while very often far more time would be needed.

In many modern processes there is definite need for a rapid means of assessing moisture, even if accuracy is to some extent sacrificed to speed. It is for this reason that the rapid electrical methods have come so much to the fore recently. They take advantage of the fact that the test material by itself is a relatively poor conductor of electricity and that increasing the moisture content raises the conductivity or, alternatively, the electrical permittivity of the material.

Balanced Wheatstone Bridge

The simplest form of the apparatus is a Balanced Wheatstone bridge consisting of four condensers. The test material is applied between the plates of one condenser and the amount that the circuit is thereby thrown out of balance is directly related to moisture content. The reading can therefore be taken instantaneously and each test requires no more than 2 or 3 minutes' operative time. Furthermore, the apparatus can easily be installed in any part of the factory and can be oper-

ated with very little training by any reasonably intelligent non-technical operator. All these instruments require preliminary calibration over a range of moisture contents for each type of product tested, usually against a standard oven method.

The accuracy of the method is, however, highly dependent on a number of factors which for some materials, may be sources of sufficient error to render the technique useless. In most instruments of this type where the resistance or permittivity is measured through a condenser, the packing effect represents a major and often uncontrolled variable. A free-running material of granular but fairly small particle size will pack fairly uniformly, and from this point of view will give consistent results. Where the material is fine but not free-running, as, for instance, with flour and many other carbohydrate products, or when it is large and irregular, as with whole cereals, particularly oats and barley, then even different replicates of the same sample will not pack similarly and will give variable readings. Two different samples of the same cereal (e.g., two parcels of oats) will produce even wider variation on this account.

Even Flow Essential

Packing is influenced to a considerable extent by the method of filling, and the accuracy of the various instruments is significantly correlated with the efficiency of the device for ensuring an even flow of material into the condenser.

The second major failing of most of the electrical moisture meters lies in the possible uneven distribution of moisture in the material under test. Surface moisture will naturally form a more or less continuous bridge or bypass between the plates of the condenser and will give a different result from a similar sample of the same moisture content but in which the moisture is uniformly dispersed throughout. On this account, most electrical instruments are only of limited use where moisture is unevenly distributed.

There are, however, some machines in which this error is reduced to the minimum.

Among future developments there will probably be further refinements of electrical methods of moisture measurement, and it would not be over-optimistic to forecast that within the next 10 or 20 years there should be accurate and instantaneous methods available for the determination of moisture in every kind of material, irrespective of its physical nature.

CHEMISTRY IN FOOD RESEARCH

Use of Electrophoresis Techniques

IN the realm of foods comparatively little is known about the chemistry of the materials responsible for texture and consistency, nor about the flavour substances and natural colouring matters. It is felt that any increased knowledge of these components will be of value in elucidating problems connected with the palatability of foods, and in the development of new processes designed to achieve improved storage and handling of food-stuffs.

Much more information is still required, for example, concerning the connective tissue components of meat and other animal foodstuffs. Among the substances so far investigated have been cartilage, collagen, elastin, and the mucin present in the white of eggs.

Food research under Government auspices in this country is in the charge of the Food Investigation Organisation. Of the three main laboratories under this organisation, the Low Temperature Station for research in biochemistry and biophysics, at Cambridge, deals especially with work of a long-term nature. In this laboratory, chromatographic methods are being applied to many fundamental problems of food research.

The Procedure Adopted

The procedure adopted by the investigators involves first the isolation of substances of high molecular weight and then the development of suitable techniques for their successive degradation, followed by a study of the products obtained.

The substances with which the investigators are mainly concerned are the connective tissues, together with the mucoproteins and muco-polysaccharides that occur in association with these substances. Thus a complex of techniques for fractionation and isolation are required. For the large molecules established physical methods such as electrophoresis or fractionation with salts or alcoholic solvents are used.

Isolation of the smaller degradation products is attained by separating the substances into main groups by the use of ion exchange resins.

Three main groups are obtained from the first separation; namely, organic bases and amino acids, neutral substances such as sugars and polyhydroxy alcohols, and

organic acids. Each of these main groups may then be analysed qualitatively, and in some cases quantitatively, by means of filter-paper chromatography.

Although paper chromatography is not usually suitable for obtaining accurate quantitative results, it has the special advantage (as shown by Consden, Gordon and Martin), that useful separations may be obtained with as many as nineteen or twenty amino acids on the same chromatogram.

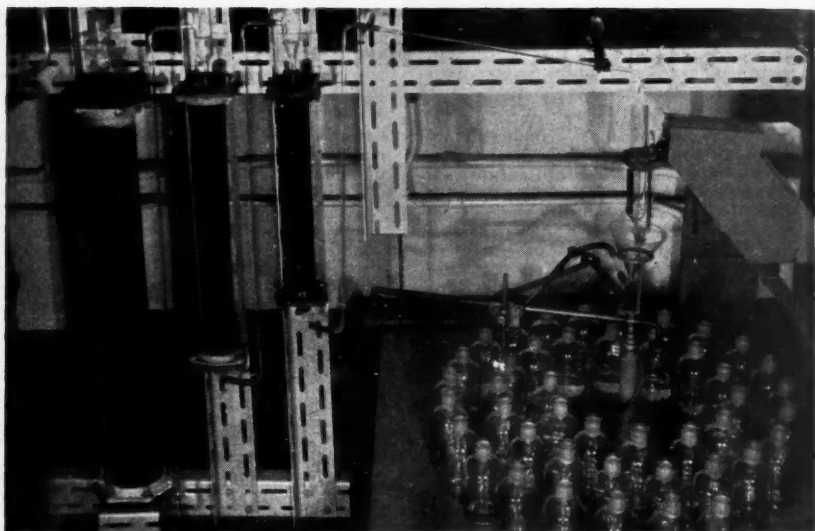
Method of Identification

Partridge at the Low Temperature Research Station was the first to work out a method for the identification of reducing sugars in mixtures by use of the filter-paper chromatogram. The use as a spraying reagent of a solution of silver nitrate of ammonia, or a solution containing aniline and phthalic acid, was found to be effective as a general method for revealing the position of the sugars on the chromatogram. The behaviour on the filter-paper chromatogram of 22 sugars and sugar derivatives was investigated, using general solvents.

For separation and isolation of the components of biological mixtures on a larger scale, column methods of chromatography are required. One such process developed at the Low Temperature Station uses various synthetic and commercial ion-exchange resins.

The ion-exchange column shown in the photograph was designed and constructed at the station and is capable of handling from 250 to 300 grams of hydrolysed protein. The solution containing the mixture of amino acids obtained from the protein under investigation is passed through columns which have been successively reduced in diameter in order to improve the boundaries. The column is then developed with a solution of a strong base and the effluent runs into an automatic fraction collector designed to collect 60 fractions.

The bottles are arranged in spirals and the correct quantity is automatically delivered to each one in turn by means of a syphon suspended from a balance arm. The contents of the bottles are analysed qualitatively by means of filter-paper chromatograms and the components of the various bands are collected together.



Where a band contains more than one amino acid, a further column procedure is required to complete the isolation.

By this method a complicated mixture of organic bases and amino acids may be separated into seven or eight fractions by a single passage through a column containing a cation exchanger. Each of these groups contains no more than two or three amino acids, so that the individual components of each group may readily be separated by the use of further columns packed with other ion exchange resins. By this procedure it has recently been found possible to isolate in a pure condition 15 amino acids from the same sample of hydrolysed protein.

A procedure adopted for the isolation of amino acids from the hydrolysis product of commercial egg albumin was as follows: Since tyrosine and phenylalanine interfere with chromatographic separation on ion-exchange resins, these were first removed, together with soluble humin, by adsorption on charcoal.

Tyrosine and phenylalanine were recovered by eluting the charcoal with aqueous phenol-acetic acid. The charcoal-treated product was then fractionated on a column of Zeo-Karb 215 by displacement with ammonia solution.

The flowing chromatogram so obtained was analysed by filter-paper chromatography. The results showed that the mixture had been resolved into seven bands: (1) aspartic acid; (2) glutamic acid, serine

and threonine; (3) glycine and alanine; (4) valine and proline; (5) leucine, isoleucine, methionine and cystine; (6) histidine and glucosamine; (7) lysine.

The amino acids or amino acid mixtures contained in each band were recovered as salt-free crystalline solids by evaporating appropriate fractions from the effluent solution. The crystalline products obtained represented a yield of 45.6 per cent calculated on the weight of dry proteins.

The isolation of individual amino acids was then achieved by further fractionation of the simplified mixtures contained in the bands. For instance, glutamic acid was isolated from Band 2 by adsorption on an anion exchange resin; a mixture of the isomeric leucines was isolated from Band 5 by selective oxidation with bromine water, followed by further fractionation on ion-exchange columns; the separation of proline and valine from Band 4 was carried out by displacing the mixture from a column of Zeo-Karb 215 at 60° C.

The ion-exchange method developed by the Low Temperature Research Station may be used for biological extracts of many kinds. It represents an attempt to evolve a systematic procedure for handling the complex mixtures of bases, sugars and organic acids so frequently encountered in biochemical research.

The fundamental nature of the work which the station is undertaking is well exemplified by an investigation of the intercellular substance of bovine cartilage,

which is composed almost exclusively of two major components, collagen and chondroitin sulphate.

It was considered desirable to make a preliminary study of the chemical structure of the intact tissue, a possible line of approach being the application of a process of successive mild degradations of one or other of the components of the tissue, followed by an examination of the breakdown products that resulted.

Since published data on the thermal contraction of collagen fibres were insufficient to afford a direct comparison with the methods devised for the extraction of cartilage, a number of experiments were carried out during the course of this work to determine the effect on rat-tail tendon of the temperature and concentration conditions used in the extraction experiments.

A soluble mucoid may be extracted from dried cartilage powder after a short heat treatment with water. It was considered probable that the chondroitin sulphate liberated under the rather mild conditions that give rise to thermal shrinking of collagen fibres, remains in a condition closely approaching its state in the tissue itself. A study of the physical and chemical properties of the extracted mucoid has therefore been of value.

Prepared under the lowest effective temperature conditions, the mucoid behaves in the electrophoresis apparatus of Tiselius as an equilibrium mixture of chondroitin sulphate, protein and a complex formed between the two. The association of chondroitin sulphate with protein in the mucoid occurs over the range pH 5.9, within which both the protein and the acid polysaccharide are negatively charged.

A Different Type

The complex formation is of a different type from the salt formation known to occur below pH 4.85. On further heating, the mucoid loses its capacity to form complexes at pH 5.9 and suffers a rapid reduction in viscosity. In the light of the knowledge gained from this investigation, it is suggested that chondroitin sulphate has an important rôle in the organisation of collagen in developing connective tissues.

Dr. Isherwood and his co-workers at the Low Temperature Research Station are engaged on what might be termed parallel investigations into the cell walls of plants. These workers are studying the polysaccharides in the cell wall during physiological changes such as ripening. Here again, the problem is being exam-

ined on a fundamental basis and effective use is being made of the filter-paper chromatogram and electrophoresis techniques previously described. Three different methods of approach have been adopted.

The first line of attack is to take the entire cell wall—that is the carbohydrate portion—and hydrolyse it to its constituent sugars. The amounts of the various sugars present are quantitatively estimated by the filter-paper chromatogram technique.

Changes Followed

By using this procedure the investigators are able to follow the changes which occur in the cell wall during ripening and similar physiological changes in terms of the changes in the constituent sugars that make up the polysaccharides. These observations do not, of course, yield any information regarding the composition of the individual polysaccharides or how the changes occur.

The second approach to the problem consists in dividing the cell wall into a number of arbitrary fractions such as pectine, hemi-cellulose, alpha cellulose, and so on, by extraction with water and increasing strength of alkali. By separation from the various arbitrary or connected fractions as good a yield as possible is obtained of pure homogeneous polysaccharides. These are then related to the sugars obtained by hydrolysis of the fraction. By working on these lines it has been possible to obtain from the parent cell wall a pure polyalacturonic acid, pure araban, a pure xylan, and a pure cellulose.

A third method of investigation is to separate the arbitrary fractions by dissolving them in a solvent such as strong sodium hydroxide, which disperses the polysaccharide molecules, and then subject these molecules to an electric field in an electrophoretic apparatus. It is possible by this means to show that the arbitrary fractions obtained from the cell wall contain a number of polysaccharides. Furthermore, it has been possible to relate the analysis of the arbitrary fractions with the electrophoretic pattern of the fraction itself.

As a result of the work already accomplished in this field, the Low Temperature Research Station have found that the cell wall of the pear fruit consists essentially of a number of polysaccharides, each of which has been built up from one sugar only. The various arbitrary fractions such as pectine, are mixtures of some or all of these polysaccharides.

Foreign Capital for German Oil Refineries

Shortages Interfere with Paint Manufacture

FOREIGN interest in the utilisation of German coal and oil distillation plant has been reflected by news of U.S. and British participation in the operation of refining capacity in Western Germany. A French group, *Omnium Français des Pétroles*, has now entered this field by arrangements concluded through its German subsidiary, *Omnipetrol G.m.b.H.* of Karlsruhe, with *Ruhrchemie A.G.* of Oberhausen-Holten.

Under this agreement *Omnium* will supply Middle East crude oil to *Ruhrchemie*. The crude will be topped in existing distillation plant, and the residue will be subjected to thermal cracking. The maximum throughput will be 200,000 tons a year, and the output of motor spirit 100,000 tons; in addition, there will be substantial tonnages of diesel oil, fuel oil, asphalt and refinery gases.

Allied Co-operation

High Commission consent has already been obtained for the scheme which will result in a considerable saving of capital. To erect equivalent refining capacity from scratch would, in present circumstances, cost about twice as much as the work to be performed at Oberhausen-Holten. *Ruhrchemie A.G.* is to repair the damaged installations and erect the new plant required in co-operation with German, French, and U.S. firms. Refining operations will be conducted on a fee basis, *Omnium* retaining possession of the crude oil and the finished products.

E.C.A. financial assistance has been secured for the refinery project at Lingen in the Emsland district where by 1952 some 600,000 tons of indigenous crude oil are to be treated. In the next two years it is hoped to raise petroleum production in Western Germany to 2,000,000 tons a year. The Lingen refinery would thus be able to process approximately one-third of the entire German crude oil output, a substantial part of which originates in the Emsland district.

The shortage of tetra-ethyl lead which caused some anxiety has been overcome for the time being by the arrival of a substantial consignment under E.R.P. auspices and grant of permission by the U.S. authorities for further shipments to Western Germany. Meanwhile one of the leading colliery undertakings in the Ruhr, *Hibernia A.G.*, has announced that it

will install plant for making tetra-ethyl lead in one of its chemical works.

Difficulties in the supply of white lead, zinc oxide, solvents and collodion are likely to force West German paint and lacquer manufacturers to curtail operations even though the linseed oil supply is assured until the middle of 1951. Some paint makers have already reduced their output. Wholesalers have been warned to expect higher prices in the near future. Some 500 firms with about 17,000 employees are still engaged in the manufacture of lacquers, despite the elimination of many post-war newcomers who took advantage of the urgent demand immediately after the war and the currency reform, but have had to leave the field since. A further contraction and concentration is expected as a result of the present raw material difficulties.

Among new products of chemical interest now made in Germany is metallic tantalum which is being produced in the form of sheets, foil and wire by *W. C. Heraeus G.m.b.H.* at Hanau which is reported to employ a novel form of surface hardening. This firm has also put on the market a new type of heating appliance for laboratory use. The heat-radiating wires are enclosed by a glass fibre mesh which is placed over the glass tubes, etc., to be heated, and surrounded by several layers of glass wool which prevent loss of heat to the outside. Temperatures of up to 400° C. are reached.

Swiss Agreement

New trade agreements have been concluded with Greece, Norway, and Iran. In all three agreements chemicals figure prominently among the principal exports from Western Germany. The German-Swiss trade agreement put into force with retrospective effect from September 1 provides for 60 per cent trade liberalisation on both sides. In addition, group quotas have been fixed which, *inter alia*, permit German imports of DM.18,440,000 worth of Swiss dyestuffs, while Switzerland has limited chemical imports from Germany in so far as not covered by the liberalisation clause to sfr.3 million.

The number of persons employed in the East German chemical industry is estimated at 120,000-150,000, of whom no fewer than 25,000 are working in the Soviet-controlled Leuna works.

CHEMOTHERAPY OF CANCER

A LECTURE on "The Chemotherapy of Cancer" was delivered to the Fine Chemicals Group of the Society of Chemical Industry at the Royal Institution on November 13 by Professor Alexander Haddow, director of the Chester Beatty Institute, the Royal Cancer Hospital.

The great majority of cases of cancer at present, said Professor Haddow, were treated either by surgery or by radiotherapy. Each of these methods had its limitations, and in any case it would clearly be advantageous, particularly as widespread dissemination was an outstanding feature of the disease, if a less local and more general control of malignancy, such as could presumably be brought about by chemical means, were possible.

This had been well recognised from the earliest beginnings of the study of cancer. At different times in the past there had been applied such agents as belladonna, aconite, mercury, antimony, and arsenic. Many of these chemical applications had a merely caustic action, as, for instance, in the local use of concentrated acids and alkalis and various metals and metalloids. Arsenic had an action which, though not specific, was less indifferent than the others, and the effects of arsenic in the treatment of cancer had been studied more continuously than those of any other agent.

There had been during the last few years a new burst of activity, arising very largely from a similar increase of interest in more fundamental work in the cancer field as a whole. In fact, more had been accomplished during the last 10 years than in any other period, though the greater part still remained to be achieved.

Unique Development

The cancer cell was a unique development of a specific cell type in an adaptive response to unfavourable conditions, and this was only one of the inherent difficulties which confronted any attempt at chemotherapy. Chemotherapy was expected to undo what could almost be regarded as a natural process.

It was perhaps not surprising that such developments in this field as had taken place in recent years had been accomplished without much thought of practical application, mostly as by-products of more important work. This was certainly so in the endocrine control of cancer of the prostate, which was of importance

as being the first indication that the autonomy of the cancer cell was not necessarily complete and that it was in fact open to attack by chemotherapy.

In the special case of cancer of the prostate pronounced therapeutic effects were produced by the administration of a natural or synthetic oestrogen, stilboestrol being the synthetic substance most frequently used. In favourable circumstances improvement consisted of a decrease in size of the primary tumour, possibly regression of metastases in bone, improvement in the blood picture, gain in weight, and relief of pain.

Therapy Prolongs Life

This therapy had now been employed for a sufficiently long time to make it clear that, while cancer of the prostate certainly could not be cured by this means, there was equally no doubt that the foci of the disease became quiescent and life was prolonged. Again, in a small proportion of cancers of the breast treated by oestrogen there was a most dramatic temporary response. A further example of chemotherapy acting through alteration of the hormonal environment of the tumour was the administration of the male sex hormone in cancer of the female breast.

Among other conditions in which the action of urethane had been tested and unusually gratifying responses had been forthcoming was myelomatosis. The action of urethane was characterised by an extremely high degree of chemical specificity, and investigators had been very much concerned to decipher the biochemical mechanism of its action. One of the various alternatives which might be considered was that the substance might renovate some deficiency in the chemical differentiation of the cell.

With regard to aminopterin, clinical effects were not sufficiently lasting, yet the observation of its action was of fundamental interest and one which would certainly play some part in extending the knowledge of the nutritional basis of cell division.

Professor Haddow came next to a different group of substances—the so-called nitrogen mustards, the biological effects of which on tissues in an active state of proliferation were recognised. During the war they had been tried in Hodgkin's disease and various malignant conditions, in which they had undoubtedly a limited therapeutic action, and it

seemed not unreasonable to expect to improve the therapeutic effect by chemical modifications. During the last four years some 250 variants had been tested at the Royal Cancer Hospital, and a number of compounds had been prepared, some of which had perceptible advantages in reduced toxicity. He mentioned in particular the chloroethyl derivative of β -naphthylamine. Recent reports indicated that substances of this type might represent a slight advance, especially in the treatment of such conditions as chronic lymphatic leukaemia. Part of the advantage related, not to any marked increase in inherent activity, but rather to ease of administration and relative absence of serious toxic effects. These compounds, like X-rays, could be responsible for nuclear damage, production of mutations, and other effects hitherto associated with ionising radiations. Quantitative comparison of various biological effects induced chemically and by radiation, both *in vivo* and *in vitro*, showed a correspondence greater than would seem likely on the grounds of chance alone. The comparison was reinforced by the more recent finding that mustards of this type, again like α and gamma radiation, could also under suitable experimental conditions induce both cancer and mutation. This must be regarded as an important contraindication to the use of them in younger subjects still in the reproductive phase.

Finally the lecturer touched on the recent developments concerning the effects of ACTH and cortisone in lymphosarcoma, chronic lymphatic leukaemia, acute leukaemia, and certain neoplastic disorders. Again it would seem that any therapeutic action here was subject to obvious limitations and accompanied by certain disadvantages and side-effects; but these observations marked a stage towards an eventual understanding of the different means, direct or indirect, by which the growth of the cancer cell could be affected.

Infra-Red Label Drier

Ildris, Ltd., recently installed a Metrovick infra-red unit for drying the bottle sealing Viskrings and also the bottle labels in one operation. The bottles pass through the unit at a rate of 300 dozen per hour, each bottle taking 20 seconds. If for any reason the conveyor speed has to be reduced, the infra-red unit is fitted with a temperature control switch to reduce the heat output of the infra-red element projectors. The unit is 8 ft. long by 1 ft. 6 in. wide and operates on 415 volts, 3 phase A.C. with a total loading of 17 kW.

SIMPLIFIED VISCOSITY TEST

AN improved method for determining the quality of cellulose has recently been devised by H. F. Launer and William K. Wilson of the U.S. National Bureau of Standards. The new method is a simplification of the cuprammonium viscosity determination, which is widely used as an aid in determining the effect of light, heat, and chemical reagents on the cellulose in paper and textiles. Advantages of the Bureau's procedure are said to be ease of preparation of the cuprammonium reagent and a reduction in sources of error during the reaction.

A Most Important Test

The cuprammonium test is one of the most important in cellulose chemistry. It involves the measurement of the time required for a definite quantity of a solution of cellulose in cuprammonium hydroxide to flow from a calibrated viscometer. This time of flow, usually measured at 20° C. or a solution containing 0.5 per cent cellulose, is related to the viscosity of the solution and therefore to the quality of the cellulose.

Cuprammonium is usually prepared by the air-oxidation of metallic copper in ammonium hydroxide. This is a laborious, time-consuming process and is further complicated by the formation of ammonium nitrate, which lessens the usefulness of the solution. As the reagent is unstable at room temperature, it must be stored at 0° C. Another disadvantage in the cuprammonium test as ordinarily carried out is the necessity of using special apparatus to exclude air during the solution of the cellulose since cellulose is particularly sensitive to oxidation.

The new procedure removes the difficulties in both stages of the process. The cuprammonium reagent is first prepared by dissolving solid cupric hydroxide in ammonium hydroxide in an ice bath. This easy method of preparation makes storage unnecessary. Cellulose is then dissolved in the reagent, with the addition of cuprous chloride and copper wire to prevent air oxidation. Rubber-stoppered Erlenmeyer flasks are convenient for this purpose and mechanical agitation facilitates the process. The time of flow of the resulting solution is measured in a viscometer enclosed in a glass jacket, through which water is pumped from a constant-temperature bath.

This procedure has been found to save both time and labour. The results compare favourably with those obtained by the older method.

INCREASING DEMAND FOR TECHNICIANS

Need to Maintain Scientific Training

THE inestimable value of the brains of our scientists and technicians in the export market and the necessity for chemists to remain true to their jobs without any material or political bias, were emphasised at the annual dinner of the British Association of Chemists held in London last Friday.

The Chemist's Role

After briefly and wittily welcoming "The Ladies and Our Guests," the president, Dr. Herbert Levinstein, turned to the more serious problems of the present difficult times and the importance of the chemist's rôle in helping to overcome them. The state of crisis would not readily pass over, and in the very near future there was likely to be much stricter control of both materials and manpower.

Sound professional people were getting scarcer and there were fewer academically trained chemists in proportion to those who were half-trained. The chemist must remain true to his profession and unprejudiced by any outside influences.

Replying for the guests, Mr. William J. Darby, chairman of Lewis Berger & Sons, Ltd., said that a good deal of any success that he had enjoyed had been linked up with the ability to use the technician and to secure his loyalty. When he joined Berger he stepped up the technical staff from 23 to 80 members—now there were some 150 throughout the group.

Nowadays he was less closely in contact with technicians and so felt able to take a more detached view. In a general way, scientists seemed to be outmoded at the moment in the public's eye—and he felt some of them deserved to be.

Industry also did not think so much of them as it did, continued Mr. Darby. There seemed to be two main reasons for this.

First, now that there was more competition for his services, the technician appeared not to be giving the same unit of effort. Secondly, there was a general apprehension that scientists were tending to move rapidly to the Left in political thought, which was causing a certain amount of mistrust.

The chemist could not afford to indulge in this form of escapism or intellectual gymnastics, continued Mr. Darby.

The country, he concluded, was gradually returning to Elizabethan times when we

sold our brains abroad and backed them up with capital to establish and maintain a predominant position in commerce throughout the world.

Today we were not able to provide the capital, and all we had left to export was our brains and technical effort as day after day countries were legislating to exclude our goods.

It was a serious thought and carried with it its own implications. These were that scientific training in this country must not only be maintained, but strengthened, and that scientists would have to be prepared to travel abroad if they wished to secure a fair share of comforts.

This country had a great heritage and despite all present problems we were expected to make it great again. There was only one way to do that—hard work. It was up to every individual never to throw up his hands and—most essential—always to retain a sense of humour.

Professor D. M. Newitt, president of the Institution of Chemical Engineers, proposed the toast of the "President and the BAC."

Among those present were:—

Dr. and Mrs. Herbert Levinstein; Professor and Mrs. D. M. Newitt; Mr. and Mrs. H. L. Howard; Mr. William J. Darby; Mr. and Mrs. T. McLachlan; Mr. O. W. Petzold; Mr. Rhodes; Mr. and Mrs. Crocker and Miss Crocker; and Mr. Davies.

B.A.C. ANNUAL MEETING

AN active and successful year was recorded in the report of the council for 1949/50 at the annual general meeting of the British Association of Chemists held in London on December 2, with the retiring president, Dr. H. Levinstein, in the chair.

The association had continued to serve its members successfully during the past year, giving advice and assistance on many problems, in some cases with substantial financial benefit.

A conference of section secretaries was held in London in July, and had proved of great value in achieving closer co-ordination between the sections and head office. It was hoped to hold a similar conference annually in future.

Membership had been maintained, and

an appeal was made for increased membership.

In spite of heavier outgoings the Unemployment Benefit Fund had increased by about £680 during the year. Benefits paid amounted to £1536 compared with £633 in the previous year. Claims, however, had been reduced during the latter part of the period under review, and were now few in number. A recommendation that bonuses given during the two previous years should be continued during 1950/51, was adopted.

The association's appointments service continued to be well patronised by members and employers. Over 100 members received the circular weekly, 156 posts were advertised at the direct request of employers, and 3249 other vacancies were included.

Attention was drawn again to the contributory, transferable, pension scheme available to members of the association, details of which were circulated in February. The special facilities offered to the members by the General Accident, Fire and Life Assurance Corporation was also pointed out. Many members had saved more than the amount of their subscription to the B.A.C. by making use of the latter arrangement.

The report was adopted.

The Hinchley Medal, commemorating the work of the late Professor J. W. Hinchley, who was a founder-member of the B.A.C. and awarded for outstanding work on behalf of the association, was presented by the president to Dr. F. W. Kay, also a founder-member and the first hon. registrar.

The New Officers

Officers elected for the ensuing year were as follows:—President, Major R. P. Porter; vice-presidents: Dr. H. Levinstein, Mr. Norman Sheldon, Mr. G. T. Gurr and Mr. T. McLachlan; hon. treasurer, Mr. H. R. Neech; hon. secretary, Dr. F. W. Kay; hon. registrar, Mr. H. L. Howard; trustees: Mr. C. S. Garland, Mr. G. T. Gurr and Mr. C. A. Wylie; hon. editor, Mr. T. Crosbie Walsh; hon. auditors, Mr. Threadkell and Mrs. A. J. Baker.

Members elected to the council were Dr. A. T. Healey, Mr. J. Wilson, Mr. Greenwood and Mr. R. J. Wilkins.

The professional auditors were re-appointed.

Proposed new rules, which had been circulated, and which effected simplification, were approved.

Satisfaction was expressed by members with the organisation at head office arranged a year ago, whereby Mr. H. Feldon Baker, F.C.A., was appointed

secretary-accountant, and Mr. G. R. Langdale, A.C.A., as his deputy.

Thanks were accorded to Dr. Levinstein and his fellow officers and councillors for their work during the past year, and special mention was made of the work of Mr. H. L. Howard as acting general secretary.

MATERIALS DISTRIBUTION

PROPOSALS to try and overcome the shortage of raw materials were decided upon at a meeting of the council of OEEC in Paris last week-end. The principal commodities involved were:—coke and coking coal, scrap iron, iron ore, some finished steel products, manganese, copper, zinc, tin, aluminium, fibres for paper and textiles, sulphur, rubber and raw materials for synthetic rubber, timber and pulp, cement, and leather and skins.

The sources of supply of many of these raw materials are not within or under the control of member countries, and the issue was one of technical complexity.

The decision of the council therefore contained a number of different recommendations, each appropriate to a given set of raw materials.

A special effort is to be made by member countries, both at home and in their overseas territories, to increase production of coal, metal ores, and sulphur; to make fuller use of existing productive capacity for coke, aluminium and pulp made from available fibrous materials; and to increase the recovery of ferrous scrap, sulphur bearing materials, waste paper and rags.

Coal is a commodity of which the member countries have plentiful supplies. Among the council's suggestions are: an equitable distribution of coal among member countries, especially of metallurgical coke and coking fines for blast furnaces; and the need to take fairly into account the requirements of all types of consumers.

The importance of non-ferrous metals, especially copper zinc and nickel for defence has been the main cause of building up of large reserve stocks in the U.S.A. It is, therefore, appreciated by member countries that supply of these metals will have to be given special consideration by the U.S.A. and Canada. The case of nations belonging to the Atlantic Pact would probably be considered collectively.

A special OEEC mission is to visit the U.S.A. to discuss raw material problems, particularly sulphur and cotton, of which America is by far the largest source of supply.

FUNDAMENTALS OF ATOMIC RADIATION

INITIATING cause of the biological effects of ionising radiation is believed to be the profound chemical changes caused by the ionisation of the constituent atoms and molecules of organisms. This is among the basic points which Dr. G. J. Neary made in his article in the current issue of "The Practitioner."

At a Press conference held to introduce this important issue, Sir Ernest Rock Carling, Adviser on Casualties to the Home Office, outlined its purpose. Accurate facts about atomic warfare were essential and the journal had therefore decided to devote a whole issue to the medical aspects in their fullest sense. This not only included questions of medical treatments, genetic effects and organisational problems but also required those interested to understand what happens under the action of radiation. It was the basic physics and associated chemistry of these phenomena which Dr. Neary discussed.

Energies of only a few electron volts are involved when an atom or molecule absorbs or emits radiation. Ionisation involves energies about 10 times greater, corresponding to the complete freeing of an electron from the atom. The electron thus detached may then attach itself to some other atom or molecule. It is this set of disturbances of the atom and the reactive properties of ions which lead to the chemical and thus the biological effects.

The Basic Measure

The basic physical measure of dose for all ionising radiations is the amount of energy absorbed per unit mass, normally expressed in ergs per gram. The *Röntgen*, historically evolved for the measure of X-rays and gamma rays and based on the ionisation of air, corresponds to an energy absorption of about 93 ergs per gram. Energy absorption for other radiations—including neutrons, for which air ionisation is a quite unsuitable measure—are expressed in "roentgen equivalent physical" or "rep." The production of ions can be used in the detection and measurement of radiation for monitoring purposes. This may be done either directly due to air ionisation, or by the chemical effects involved. For this purpose the blackening of photographic film or the change of colour of crystals may be applied.

A small percentage of the energy of an

explosion appears as fast neutron radiation of such intensity that exposure up to about a 1000 feet away would of itself prove fatal. The neutrons very rapidly lose energy, in traversing matter; their initial energy of a few million electron volts is rapidly reduced to the level of energy of ordinary thermal agitation. They may then be captured by a nucleus forming a radioactive isotope which will then disintegrate emitting beta and gamma rays. An undersea burst could result in the formation of radioactive sodium Na^{24} .

Gamma Rays Important

The most important ionising radiations from an atomic explosion are the gamma rays both from the explosion and from radioactivity of the fission fragments. These break down ultimately to stable fission products, through a series of radioactive changes according to the exponential law of decay for each successive unstable nucleus. The activity of radioactive material is measured in terms of the number of nuclei transforming per unit time. The unit is the *curie*, representing 3.7×10^{10} disintegration per second—approximately the activity of one gram of radium. In an atomic explosion roughly a million million curies are produced immediately and roughly one-tenth this quantity in subsequent radiations with a rapid decrease in the rate of change. For instance, activity falls to six thousand million in one hour, thirteen millions in one week and one hundred thousand after one year.

Intensity falls off with distance both because of the inverse square law and because of the attenuating effect of encounters with atoms. The attenuating power of a medium is dependent on its density and on its atomic composition—both physical and chemical. Heavy atoms are much better absorbers than light atoms.

Lastly, the question of ingestion and inhalation of active material is of great importance. Many chemical elements tend to get concentrated and localised in particular organs producing a higher intensity of chronic irradiation than if they were uniformly distributed. Standards now exist for safety levels of radioactivity in air and water which would help in assessing the hazard in a particular set of circumstances.

Non-Ferrous Metal Statistics

CONSUMPTION of non-ferrous metals in the United Kingdom in October was generally greater than in the same month of 1949. Although production was higher (with the exception of primary refined copper) there was a considerable reduction of stocks.

Details from the summary issued by the British Bureau of Non-Ferrous Metal Statistics showed closing stocks at the end of October in long tons were: Blister copper 39,271 (52,568); refined copper 81,140 (91,299); zinc in concentrates 43,462 (39,886); slab zinc 40,981 (65,114). Lead, however, improved, imported virgin stocks being 63,829 (57,348) and English refined 8215 (2277).

There was again a marked increase in the export of tin, the total figure being 1168 long tons as against 724 long tons in October, 1949, and 1118 long tons in September this year.

UNWROUGHT COPPER

	Long Tons	
	Blister Copper	Refined Copper
OPENING STOCKS:		
Govt. and consumers' ...	41,626	79,762
Imports ...	9,002	18,597
PRODUCTION:		
Primary ...	—	9,475
Secondary ...	1,280*	6,572
CONSUMPTION:		
Primary ...	9,606	28,935
Secondary ...	—	18,265
Exports ...	1,027†	4
CLOSING STOCKS:		
Govt. and consumers' ...	39,271	81,140
* Rough copper.		

† Includes 326 tons of rough copper despatched to Belgium and 701 tons of rough copper to Germany for refining on toll.

GROSS OUTPUT OF MAIN COPPER, ALLOY AND PRODUCTS

Unalloyed copper products ...	27,299 long tons
Alloyed copper products ...	25,131 " "
Copper sulphate ...	5,624 " "

UNWROUGHT ZINC

	Long Tons	
	Zinc in Concentrates (estimated gross Zinc content)	Slab Zinc (all grades)
OPENING STOCKS:		
Govt. and consumers' ...	43,071	48,414
Imports ...	13,124	7,768
PRODUCTION:		
Virgin and remelted ...	4	5,607
CONSUMPTION:		
Virgin (incl. debase)	6,737	21,212
Remelted and scrap	—	8,651*
Exports and re-export	—	11
CLOSING STOCKS:		
Govt. and consumers' ...	43,462	40,981

* Includes a small quantity of zinc concentrates consumed directly for chemicals, etc., which is also included as consumption of concentrates.

LEAD

	Lead in Concentrates	Imported Virgin Lead	English Refined	Lead Content of secondary Scrap and Residues
OPENING STOCKS:				
Govt. and consumers' ...	—	64,105	7,104	—
Other stocks ...	55	—	—	197
IMPORTS ...	—	14,592	—	—
PRODUCTION ...	292	—	7,551	—
CONSUMPTION ...	270	14,259	6,440	8,432
EXPORTS ...	—	16	—	—
CLOSING STOCKS:				
Govt. and consumers' ...	—	63,829	8,215	—
Other stocks ...	77	—	—	—

TIN METAL

	Long Tons
GOVT. AND CONSUMERS' STOCKS (at end of period) ...	7,839
IMPORTS ...	600
PRODUCTION ...	—
CONSUMPTION ...	1,942
EXPORTS AND RE-EXPORTS ...	1,168*
* Exports total 1168 tons, of which to U.S.A. 654; Egypt, 75; Sweden, 53; Syria/Lebanon, 51; S. America, 48; Germany, 47; Netherlands, 45; Canada, 45.	

ANTIMONY

	Long Tons
TOTAL CONSUMPTION OF ANTIMONY METAL AND COMPOUNDS ...	552
TOTAL CONSUMPTION OF ANTIMONY IN SCRAP ...	356

CADMIUM

	Long Tons
TOTAL CONSUMPTION OF CADMIUM ...	43.55

New Australian Directory

RECENT expansion of the Australian chemical manufacturers is indicated in the second edition of the Directory of Industrial Chemicals, which shows that 199 new chemicals are now being made locally.

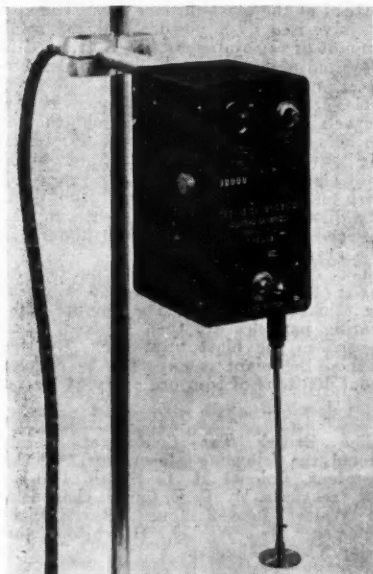
The first edition, published two years ago, by the Department of National Development, showed that 585 chemicals were then being made by 180 manufacturers. Although 63 of these chemicals are no longer made, the total now being manufactured is 712, and the number of registered manufacturers has increased to 188.

In 1939, the industry, including the section making explosives, comprised 250 factories, employing 8100 persons. By June, 1949, there were 408 factories, employing 14,611.

The directory is the only one of its kind published in Australia and may be bought from the Australian Trade Press Agency, 15 New Bridge Street, London, E.C.4 (7s. 6d.).

New Laboratory Equipment

GELATION time may now be estimated by means of a gelation timer, developed by Techne (Cambridge), Ltd. The new instrument is self-indicating and may be left working over-night or at week-ends, without attention. A weighted disc or rod is immersed in the oil under test and subjected to a simple harmonic vertical motion by means of a synchronous electric motor. As the liquid sets, a point is reached when the stiffness is sufficient to support the disc or rod during a 30 seconds half-cycle. When this occurs, the connecting link is compressed and operates a relay, stopping the motor and lighting a small neon lamp to attract attention. The gelation time may then be read off on the counter. Experiments on a range of urea formaldehyde and resorcinol formaldehyde adhesives have shown the results obtained with the gelation timer to agree closely with directly observed results.

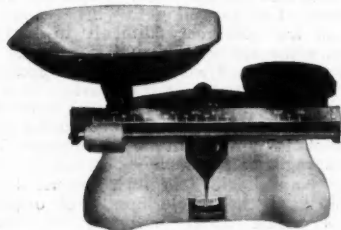


[By courtesy of Techne (Cambridge) Ltd.]

The Gelation timer for oil testing

A **ROTATING** balance for weighing large samples in the laboratory has been produced by J. W. Towers & Co., Ltd.,

Widnes. This balance, model No. 7, can have either a flat or scoop pan. It will weigh up to 6 kilos and is sensitive to 0.5 gm. No weights are necessary under 1 kilo. The rotating weight arrangement covers the range 0-1000 gms., and each division on the weight is 0.5 gm.



[By courtesy of J. W. Towers & Co., Ltd.]

Rotating-weight balance model 7. The rod carrying the rotating weight is screw threaded on the top only, which enables the weight to be moved from one end of the rod to the other by lifting it slightly. Final adjustment is made by rotating the weight on the screw thread

A **NEW** range of externally fan-cooled, flameproof electric motors is announced by the Electrical Power Engineering Co. (Birmingham), Ltd., in its leaflet No. 7750. The design, which has been thoroughly tried out in the chemical industry and by leading oil companies, is particularly suitable for pumps, compressors, mixers and centrifugal fans. * * *

DESIGN, machining and finishing of stainless steel castings are the subject of a well-illustrated brochure issued by Paramount Alloys, Ltd. Special reference is made to a general purpose alloy of the molybdenum bearing type developed with the co-operation of the parent concern, the A.P.V. Co., Ltd. * * *

THE rôle of aluminium in the rubber industry is vital and varied. It has a natural resistance to the corrosive action of chemicals as well as an absence of rust, and no impurities of any kind are imparted from aluminium to the latex or coagulum. The importance of the metal as an aid to production is described in "Aluminium News" for November, published by the Aluminium Union, Ltd.

METALLIC SOAP DRIERS

METALLIC soaps made from 2-ethyl hexoic acid or α -ethyl caproic acid are gaining acceptance as paint driers on account of their uniformity, light colour, freedom from objectionable odour and lower non-volatile content at the same metal content as the naphthenate driers. It is now realised that the straight naphthenic acid salts although greatly superior to the older types of driers, such as the oleates, linoleates, resinates, etc., possess certain inherent disadvantages which are extremely difficult to correct even when special additives are added to the paints or an excess of acid is present. To some extent the driers based on 2-ethyl hexoic acid, known as octoates, overcome some of the defects of the naphthenates and it is convenient to summarise the advantages as follows:—

1. Naphthenic acid is a generic term applied to the whole family of organic acids which occur naturally in crude petroleum. The acids obtained from different petroleum sources differ in composition, thus making uniformity of drier difficult to attain.

2. 2-ethyl hexoic acid is a synthetic product, constant in properties. Its molecular weight is 144.12, specific gravity 0.903 at 20 deg. C.; melting point <0 ; boiling point 223 deg. C. This means that metallic soaps made from the acid can be standardised to a greater degree than is possible with variables such as naphthenic acid.

3. Although in general the octoates behave in a similar manner to the naphthenates and can be used pound for pound with the latter, in some alkyd formulations they are claimed to be superior. Paint manufacturers in the U.S.A. have reported that the octoates show a tendency to stain less than the naphthenates, give appreciably faster dry times and are more stable in solution. Under adverse drying conditions of high humidity the octoates are very effective and there is evidence to show that loss of drying time due to pigment absorption is completely eliminated by the use of those driers.

Lead, cobalt, manganese, zinc, calcium, cadmium, strontium, iron and copper octoates can be made from 2-ethyl hexoic acid in petroleum solvent. The same metal contents are made in the naphthenates and the octoates and, in general, the two classes of driers find parallel uses in paint manufacture. It is satisfactory to note that octoates do not form sludge or precipitates on storage and they are free-flowing at both high or low temperatures.

Paint technologists consider it likely that driers made from 2-ethyl hexoic acid will receive special consideration by manufacturers for use in new formulations based on the alkyds. In maleic—dehydrated castor oil varnishes; the octoates are particularly suitable and are superior to the naphthenates on account of their faster drying times.

Smoke Prevention in U.S. Plant

THE problem of smoke abatement was carefully considered in the construction of the National Works of the United States Steel Corporation's National Tube Company, at McKeesport, Pennsylvania, which includes five new smokeless stacks.

Two modern gas washers and companion electrostatic precipitators for cleaning gas from the blast furnaces were installed for use in the mill's new high-pressure boiler plant.

A further anti-smoke development was the erection of dust collectors. These virtually eliminate the fly ash coming from the boiler stacks when coal is used for fuel instead of the blast furnace gas. The coal is pulverised to a powder and the small amount of remaining fly ash is trapped in a system of filters between the boiler furnaces and the stacks.

Gas from the four blast furnaces is now cleaned in two stages, first through the gas washers, then in the precipitators. Inside the washers, the gas is cleaned by a multiple battery of water sprays, which wash out minute particles of iron dust. The dust content of the gas entering the boilers is reduced to about one hundredth of a gram per cubic foot.

The dust recovered from the furnace gas is collected as sludge in a 90 ft. circular thickening tank. The minute iron-bearing particles are then "caked" and re-used in the blast furnaces. By this method the plant is expected to recover about 100 tons of iron ore every 24 hours.

The British Tar Confederation has elected the following officers for 1950-51: President, Colonel H. C. Smith, C.B.E.; hon. treasurer, Mr. C. E. Carey; chairman, Sir Walter Benton Jones, Bart.; vice-chairmen, Mr. W. K. Hutchison and Major A. G. Saunders.

G. LEWIS, D.Sc. Chem. Eng. (Prague), M.I.Chem.E., M.Inst.F., has recently been co-opted to the board of directors of Britannic Alloys, Ltd., as technical consultant.

THE CARRIAGE OF DANGEROUS CHEMICALS

SPECIAL regulations exist on British Railways by which products and materials for carriage by rail are classified according to their particular hazard, viz., explosive, inflammable, corrosive, poisonous, etc. These regulations appear in a special publication known as the *Dangerous Goods Classification*.

Each category of traffic has its own regulations which stipulate the form of packing acceptable and indicate which of the required special labels are to be affixed. The labels, which have either coloured background or coloured letters, not only show the nature of the hazard but give simple directions to the railway staff concerned in the handling and loading of the materials. For example, packages containing inflammable liquids which have a flash point below 73° F. must be labelled "Highly Inflammable"; dangerous, corrosive and poisonous chemicals, according to the nature and degree of hazard, are labelled "Poison. Not to be loaded with foodstuffs or foodstuffs empties"; "Keep far apart from foodstuffs"; "Not to be loaded with acids," etc.

Because British Railways are not common carriers of dangerous goods it is usual in the case of new products for traders initially to submit samples. These are examined by competent railway chemists who determine in which of the foregoing categories they fall and the form of packing most suitable. Where the characteristics of a particular commodity make it desirable, consultations take place between Railway and H.M. Home Office. Considerations take into account the safety of the public and users of the railway, railway personnel and property, and the protection of other goods in course of transit. In this way the dangerous goods classification has kept abreast with modern development; new entries being made and, where necessary, earlier ones modified. Discounting the index, general regulations and by-laws the classification has grown from a document of about 30 pages in 1900 to over 100 pages at the present time.

The effectiveness of railway regulations can best be judged from the fact that it is very rare that incidents occur in which dangerous substances are involved during transit. One need only pause for a moment and reflect on the railways' record during the late war when considerable quantities of dangerous traffics were in evidence. Such

rare criticism as is made of railway conditions governing dangerous goods is usually to the effect that they are too onerous, and the required standard of packing too high.

Requests for materials to be accepted in sub-standard packages are dealt with on merits; where the packages are considered suitable to withstand normal conditions of transit they are accepted and kept under review.

As a general practice, dangerous goods are not accepted for carriage by passenger train although this service is used for samples or small quantities of certain products.

Recent additions to the classification of dangerous goods have included:—

INFLAMMABLE LIQUIDS	DANGEROUS, CORROSIVE AND POISONOUS CHEMICALS
---------------------	--

Class A, i.e., flashing
below 73° F.

Section 1

Propyl Nitrate.*
Completely soluble in water,
and compositions made
therewith (flashing below
73° F.)

Aceton Cyhanhydria
Para-nitro-benzole
Acid.

Isopropylamine
Tetrahydrofuran

PERMANENT GASES
Compressed Carbon
Tetrafluoride

Class B, i.e., flashing below
150° F. but not below
73° F.

Butyl Titanate

Instrument Industries Exhibition

THE first British Instrument Industries Exhibition will be held in London next year at the National Hall, Olympia, from July 4-14.

Coinciding as it does with the Festival of Britain, it is hoped that the exhibition will provide an opportunity of showing to the world the high quality of British scientific and industrial instruments.

Members of associations which are supporting the exhibition have a prior claim for stand space, but non-member firms are welcome to take part on application to the organisers, F. W. Bridges & Sons, Ltd.

Firms giving their patronage and active support are: The Scientific Instrument Manufacturers' Association of Great Britain, Ltd., The British Lamphown Scientific Glassware Manufacturers' Association; The British Industrial Measuring and Control Apparatus Manufacturers' Association; The British Electrical and Allied Manufacturers' Association; and the Drawing Office Material Manufacturers' and Dealers' Association.



The Chemist's Bookshelf

TITANIUM : ITS OCCURRENCE, CHEMISTRY AND TECHNOLOGY. Jelks Barksdale. 1949. New York : The Ronald Press Company. Pp. xii + 591. Figs. 15. \$10.

The author, who for a number of years has been engaged in research on titanium, has been impressed by the lack of a comprehensive working reference volume on this element. Recently, titanium has come to the fore as an important industrial element, and the importance derived from its growing range of applications is reinforced by its widespread occurrence. An attempt has been made to make this book completely comprehensive and detailed, except in the chapter dealing with the analytical chemistry of titanium, where the approach is more general.

Broadly speaking, the first 40 pages are concerned with the occurrence of the element, and these are followed by 70 pages devoted to the chemistry of the element and its compounds. About 300 pages discuss every phase of titanium compounds in the pigment industry, this being by far the most extensive section. The metal industries are dealt with in about 40 pages, while uses of titanium and titanium compounds in the electrical industry, and for ceramics, mordants and dyestuffs, catalysts, etc., occupy about 30 pages.

The extent to which the author's claim to completeness can be substantiated may be judged from the fact that the literature references, which are arranged by chapter in a final section, occupy no less than 78 pages, although printed in smaller type than the body of the book. There is a comprehensive subject index, but in view of the vast range of literature cited the addition of an author index would also have been very useful.

It is inevitable that a volume with such an aim should be uncritical. This explains the inclusion of references to such things as "induction valence" in the section on titanium, peroxides, and the variations without any directive as to the most acceptable value, in the figures quoted for some physical properties. However, random consultation on a wide range of

topics connected with the element brought to light no obvious gaps in the subject matter.

Although relatively free from typographical errors, the book is not completely so. A curious instance appears on p. 47, where, within 19 lines, "isotypes" occurs twice, "isotropes" twice and "isotopes" twice—suggesting a lavish impartiality.

This book will provide a valuable source of information for all those interested in any aspect of the chemistry or technology of titanium.—C.L.W.

SYNTHETISCHE METHODEN DER ORGANISCHEN CHEMIE. W. Theilheimer, 1950, S. Karger A.G., Basle, Switzerland. Pp. xi + 360. S. Fr. 37.

This book is the fourth of a standard series, and continues the work of the previous volumes in collecting organic synthetic methods over the period of one year. Essentially it consists of abstracts from papers published in 1947 and 1948, with supplementary references from 1949. Reaction titles from the preceding volumes are included, together with new references. The alphabetical index has been limited in this book, because volume 5, which is to be published in English, is intended to contain a cumulative index and also all the reaction titles given in the previous volumes.

Compared with its predecessors the present book has the great advantage of giving directions to the complicated methods and system of classification of reactions and additional characteristic reagents. A key to the index, in English, is included. Also in English is a convenient survey of reaction symbols, as well as separate supplementary references.

The editorial preparation of the book has been subsidised by substantial grants from leading American chemical firms and the author acknowledges their generosity and interest in this promotion of chemical literature. Because it gives a continuous record of new organic syntheses and of standard methods and subsequent improvements, this collection should prove a useful supplement to the Beilstein series.—F.N.

• PERSONAL •

THE City and Guilds of London Institute announce the following appointments:—

Honorary treasurer: SIR GEORGE ALWYNN, Bt. *Vice-presidents:* PROFESSOR R. S. HUTTON, Dr. W. T. PRIDEAUX, and SIR HENRY A. STEWARD who was chairman of the technology committee from 1931 until 1946.

Dr. A. R. LEE, A.R.C.S., D.I.C., F.Inst.P., has been appointed a deputy director of road research, DSIR. He will have the rank of deputy chief scientific officer.

Since 1937 Dr. Lee has been in charge of the bituminous section of the road research laboratory, and during this period many advances in the knowledge of the properties and uses of bituminous binders have been made. He and his colleagues have also established the nature of the destructive effect of atmospheric oxidation on bituminous surfacings generally.

The doctor was educated at Portsmouth Municipal College and the Royal College of Science, which he entered as a Royal Scholar. He joined the staff of the chemical research laboratory, DSIR, in 1924. In 1934 he was transferred to the road research laboratory.

From 1947 to 1949 Dr. Lee was chairman of the road and building materials group of the Society of Chemical Industry.

The Institute of Physics announced the election on November 16 of three new Fellows and 11 associates. In addition 27 graduates, 18 subscribers and 81 students were elected. The new Fellows are:—

M. R. GRIDLEY (Chelmsford, Essex); J. W. SHARPE (Runcorn, Cheshire); and R. S. T. KINGSTON (Australia).

PROFESSOR E. D. ADRIAN, O.M., was last week elected president of the Royal Society in succession to SIR ROBERT ROBINSON who has held the post for five years. Professor Adrian has held the office of foreign secretary to the Royal Society since 1946. His work has been mainly concerned with investigations on the central nervous system and the whole subject of electroencephalography rests almost entirely on his fundamental work.

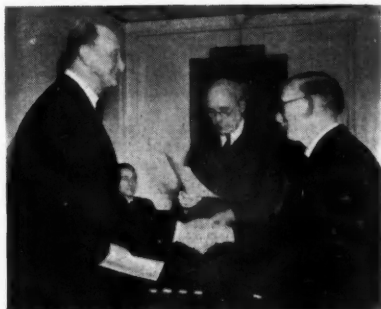
A PROUD record of long and loyal service was recognised on November 30 at a meeting held in the staff restaurant of John-son, Matthey & Co., Ltd., Hatton Garden, London, the well known refiners and manufacturers of gold, silver and the platinum metals.

In instituting a scheme of long service awards, the company had decided to make appropriate presentations to employees on the following basis:—

On completion of 20 years' service the sum of £15 free of tax; on completion of 30 years a further £25, together with a Certificate of Service bearing the company's seal, and on completion of 40 years a gold watch.

At this first presentation a total of 370 members of the staff and works had qualified for one or more of these awards, 112 employees having completed 30 years and a further 33 more than 40 years' service. Of this last group two members had achieved no less than 50 years' service with the company.

Mr. H. W. P. Matthey, chairman of the company, in presenting the awards said that he was gladly mindful of the faithful and loyal service they had given, and that it meant very much to him that there could still exist the happy relations of which the ceremony was symbolical.



Mr. H. W. P. Matthey, chairman of John-son, Matthey and Co., Ltd., presenting a gold watch and Certificate of Service to Mr. W. F. Tacon, who has completed 50 years' service with the company

HOME

Long Service Awards

Over 100 employees of Lever Brothers and Unilever, Ltd., were presented with inscribed gold watches on November 27. The watches, which were given for fifteen years' good service, were presented by Sir Geoffrey Heyworth.

Houses for Atomic Workers

Up to 30 houses will be provided by Golborne U.D.C. in the Culcheth area for families of scientific workers coming to work at Risley atomic research department, near Warrington. The Ministry of Health has told the council that their housing programme for 1951 will be increased accordingly.

New Wharf for Oil Port

Building of a new wharf as part of the development of a 57-acre site owned by Associated Ethyl Co., Ltd., has begun at Stanlow, Ellesmere Port. The company's activities are closely linked with the development of Ellesmere Port as one of Britain's great oil centres. The new wharf will have a frontage of 600 ft. to the Manchester Ship Canal and will be able to accommodate ocean-going vessels.

Tin Prices Easier

A general fall in quotations for tin occurred on the London Metal Exchange during the week. After a drop of £55 on December 1, cash was quoted at £1065-£1075 a ton and three months fell by £50 to £975-£980. Prices were again easier on December 4 with cash at £1037 10s. and three months £967 10s. Tin for delivery in late February was sold at £1000.

Coated Paper for Rust Prevention

Trials carried out by the Austin Motor Company with Shell V.P.I. coated paper, supplied by Leonard Stace, Ltd., Cheltenham, and R. A. Brand & Company, are the subject of a recent report by Shell Chemicals, Ltd. The problem was to prevent the rusting of pressed steel parts packed for export without elaborate preparation prior to packing, and subsequent expenditure on cleaning at the receiving plant. Trial packs were prepared with Shell V.P.I. coated paper interleaving steel parts packed as received from the pressing shop, and these packs were shipped to India, Australia, and South Africa. The success of these trials may be gauged by the fact that the Austin Company is now dismantling an expensive rust prevention plant which has been in use for less than a year.

U.K. Aluminium Supplies

Mr. G. Strauss, Minister of Supply, announced in the Commons on December 4 that "supplies of both virgin and secondary aluminium are fully adequate to meet the defence programme."

New Works in Operation

Expansion in production of chemical, analytical and pharmaceutical balances is announced by William A. Webb, Ltd. The company is now installed in its new works at 1-9 Perryman Farm Road, Newbury Park, Ilford. (Telephone: Valentine 6370.)

Science Masters' Association

The jubilee meeting of the Science Masters' Association will be held in the physics department of the Royal College of Science, South Kensington, from January 2-5, 1951. Among the items in the trade exhibition, W. & J. George & Beker will be showing a wide range of scientific apparatus, including balances for student use, and an improved type of precision magnetometer.

Seaweed Tests

The Scottish Seaweed Research Association is carrying out tests with a new quick-drying process at Kenton, Suffolk, with a view to establishing similar plants—if successful—in the West of Scotland. A consignment of 14 tons of West of Scotland seaweed has been dispatched to Kenton to initiate tests with the equipment. Meantime, research work on seaweed is continuing in several Scottish areas. The seaweed industry is gathering impetus under the continued attention of several organisations and companies, and is now the subject of research work in a number of laboratories in Scotland.

Anodising Process for Industry

Following a settlement of a claim between the Ministry of Supply and Alumilite & Alzak, Ltd., two patents concerned with sulphuric acid anodising of aluminium, which were assigned to the Ministry of Supply in February this year, have been allowed to lapse. The patents are: *British Letter Patent No. 474,609*—Improvements in and relating to colouring treatment of anodic coatings of aluminium and its alloys. *British Letters Patent No. 476,161*—Improvements in or relating to the anodising of aluminium and its alloys. The inventions of these two patents have been available to industry in this country since April 30, 1950.

OVERSEAS

Synthetic Fibres in East Germany

A pilot plant for the manufacture of Perlon is reported to have begun operations in Premnitz, Eastern Germany. Large-scale production is expected to start early next year.

More Phosphates from French Morocco

A scheme for a large-scale investment of French francs in order to increase phosphate output in French Morocco to four million tons a year by 1952 is being considered by the Office Chérifien de Phosphates.

Copper Shortage in Switzerland

World rearmament is causing a serious shortage of copper in Switzerland, it was stated this week by the Swiss Government. Substitutes should be used wherever possible, and it was announced that a system of permits to use copper would be instituted.

More Swiss Dyestuffs Exports

Exports of dyestuffs from Switzerland have increased in value from Fr.20.7 million in September to Fr.22.1 million in October. Exports of industrial chemicals rose from Fr.7.5 million to Fr.8.1 million, but shipments of pharmaceutical products declined somewhat.

Fire Resisting Paint

A new paint, which shrivels into a fine black ash under heat, but will not burst into flame, has been produced in the U.S.A. especially for the interiors of ships to reduce the hazards of fire at sea. The paint, which is fast drying and resistant to corrosion and abrasion, is claimed to retard the spread of fire.

Methane Reduction of Zinc Concentrates

The conventional method for smelting zinc in horizontal retorts may soon be superseded by a new process developed by the U.S. Bureau of Mines. In recent years, silicon carbide retorts with much better heat-transfer characteristics than fire clay have been supplanting the old retorts, but the practical impossibility of recovering the carbon monoxide formed in the reduction causes a large loss of fuel. The new method entails reduction of zinc oxide by passing methane through a bed of zinc sinter at 1000-1050° C. A pilot plant for the experimental gaseous reduction of zinc has been erected at Rolla, Mo. Results of the experiments have just been published in Bureau of Mines Report of Investigations 4790.

Chilean Iodine Price Increased

The Chilean Nitrate and Iodine Sales Corporation has increased the price of raw iodine by U.S.18 cents to U.S.\$1.70 per lb.

New Sulphur Works in West Germany

Production of sulphur at a new plant, with a daily output capacity of five tons of pure sulphur, has recently been started by the Gelsenkirchner Bergwerks-A.G., Essen.

Swiss S.C.I. Meeting

The Swiss Society of Chemical Industry recently held its 70th annual general meeting in Basle. Professor Taddeus Reichstein read a paper on the heart-stimulant glucosides, on which he has been carrying out research.

Phosphorus Research Laboratory

A laboratory for research on phosphorus is to be built by the U.S. Government near Sheffield, in the Muscle Shoals area. A contract for construction of the project has been concluded with the Kellogg Corporation of New York.

Hungarian Fertiliser Production

Output of fertilisers in Hungary in 1949 reached a total of 140,000 tons, an increase of 55,000 tons over the pre-war production. A further rise in output is shown in the first six months of this year for which the total aimed at 500,000 tons.

U.S. Sulphur in September

The U.S. Bureau of Mines reports that the U.S. domestic industry produced 446,245 tons of sulphur during September. Shipments reached 533,437 tons, a record for any month. At the end of September, producers' stocks had fallen to 2,835,688 tons.

Polish Scientist's Anniversary

A meeting to commemorate Jendrzef Sniadecki, the Polish scientist, was recently held in Warsaw by the Warsaw Scientific Society. It is 150 years since the publication of Sniadecki's "Beginnings of Chemistry" which formed the basis of much chemical development in Poland.

Vinyl Plastic Stencil

The facsimile process, employing electrical impulses, has been applied in America to transferring office forms, layouts, and engineering drawings to a vinyl plastic stencil for mimeographing. The system, which eliminates hand-cutting of stencils, takes only about six minutes and the plastic stencil, it is claimed, can make more than 10,000 copies.

Next Week's Events

MONDAY, DECEMBER 11

Royal Institute of Chemistry

London: School of Hygiene and Tropical Medicine, Keppel Street, W.C.1, 6.30 p.m. D. H. Bell: "The Manufacture of Inorganic Chemical Reagents."

Society of Chemical Industry

Leeds: Chemistry Lecture Theatre, The University, 7 p.m. Dr. L. A. Jordan: "Paints, Surface, Finish and Design."

Institute of Fuel

Liverpool: Municipal Annexe, Dale Street, 2.30 p.m. W. V. Battcock: "The Coal-fired Open-cycle Gas Turbine."

Institute of Metals

Glasgow: 39 Elmbank Crescent, C.3, 6.30 p.m. J. D. Glen: "Non-ferrous Metals in the Locomotive Industry."

TUESDAY, DECEMBER 12

Hull Chemical and Engineering Society

Hull: Church Institute, 7.30 p.m. Dr. N. Gebbie: "Science and Public Health."

The Chemical Engineering Group (SCI)

London: Burlington House, Piccadilly, W.1, 5.30 p.m. Dr. Ir. Hoog: "The Development of Catalysts in Industrial Chemistry."

Society of Chemical Industry

Liverpool: Chemistry Lecture Theatre, The University, 6.30 p.m. Prof. T. P. Hilditch: "The Fats: 1900-1950. An essay in historical chemistry."

Institute of the Rubber Industry

Manchester: Engineers' Club, Albert Square, 6.15 p.m. Dr. C. M. Blow: "The Testing and Grading of Raw Rubber."

WEDNESDAY, DECEMBER 13

Society of Chemical Industry

Birmingham: The University, Edmund Street, 6.30 p.m. A. R. Lockwood: "Dextran Blood Plasma Substitute."

London: Burlington House, Piccadilly, W.1, 6.15 p.m. Meeting of the Food Group. "Factors in Distribution Affecting the Quality and Nutritative Value of Foodstuffs."

Plastics Institute

Glasgow: Institution of Engineers and Shipbuilders, 39 Elmbank Crescent, C.2, 7.30 p.m. Dr. V. Stannett: "Cellulose Acetate Moulding Powders and Future Developments."

Society of Dyers and Colourists

Nottingham: Victoria Station Hotel, 7 p.m. A. L. Horobin: "Textile Applications of the Amino Resins."

THURSDAY, DECEMBER 14

The Chemical Society

London: Burlington House, Piccadilly, W.1, 7.30 p.m. H. R. Cooper and H. W. Melville: "The Oxidation of *n*-Decaldehyde." Other papers by R. M. Barrer, E. A. White and D. C. Jones.

The Textile Institute

Kidderminster: Staff Canteen, Carpet Trades, Ltd., 7.30 p.m. R. H. K. Thomson: "Ardil."

Royal Institute of Chemistry

Hull: Royal Station Hotel, 7.30 p.m. Prof. E. G. Cox: "Electrostatic Hazards in Industry."

Nottingham: Technical College, 7.15 p.m. R. C. Chirnside: "Analytical Chemistry, Chemical Analysis and the Analyst."

Edinburgh: North British Station Hotel, 7.30 p.m. Dr. E. M. Dodds: "Modern Trends in Fuels and Lubricants."

Institute of Metals

Sheffield: Grand Hotel, 6.30 p.m. R. Haynes: "The Isothermal Transformation of Copper-Base Alloys."

Incorporated Plant Engineers

Maidstone: Lecture Theatre of the Maidstone Technical College. T. W. Palk: "Thermostatic Control."

FRIDAY, DECEMBER 15

Electrodepositors' Technical Society

Sheffield: Grand Hotel, 6.30 p.m. E. A. Ollard: "Heating and Filtration of Solutions."

To Study Drying

THE Institute of Fuel has organised a series of meetings to discuss the methods and principles involved in the drying of materials. The first of these meetings was held on December 5, when two papers were read, including "Estimation of Moisture" by A. H. Ward, which appears in this issue on page 783. Further meetings will include papers on the drying of sand and fuel; drying technique; drying in the pottery industry; drying in the textile, paper and allied industries; drying of animal by-products, drying of pastes, powders and crystals; drying of liquids, solutions and slurries and drying in agriculture.

The Stock and Chemical Markets

MARKET setbacks due to the serious Korean developments have not been followed by a return of buyers, although selling has ceased and there is a generally firmer undertone, awaiting the result of Mr. Attlee's mission to the U.S.

British Funds have again moved lower partly due to revived talk of the possibility that a big defence loan will have to be floated early in 1951. Industrial shares have failed to attract at the recent reduced levels. Sentiment has been affected, not only by the prospect of higher taxation next year, but by the possibility of drastic rationing of materials for industry unless the U.S. makes available larger supplies of metals and similar requirements for the British arms drive. Even armament shares have failed to attract buyers despite general confidence that their dividends will be maintained.

Chemical and allied shares have moved back with the general trend on the Stock Exchange, although they have recently turned steadier, and, on balance, movements in many cases have not been more than a few pence. Imperial Chemical were 41s. 10½d., Monsanto, 50s. 6d. and Brotherton, 21s. 3d., Fisons eased to 25s. 3d., and now yield over 7 per cent, while Albright & Wilson kept steady at 30s. 9d. Amber Chemical 2s. shares receded from 2s. 9d. to 2s. 6d., on the absence of an interim dividend. F. W. Berk were steady at 12s. 6d., Boake Roberts, 34s. 9d., Bowman Chemical 4s. shares, 5s. 9d., and W. J. Bush were firm at 80s. Laporte Chemicals 5s. units were 10s. 3d.

There was again a good deal of activity in Glaxo Laboratories around 57s. Buyers took advantage of any decline in price because of prospects of a higher dividend and an offer of additional shares to shareholders on attractive terms when more capital is required. Despite market hopes of a higher dividend, Turner & Newall, at 88s., have come back further with the general trend, but Triplex Glass, at 26s. 9d., regained part of an earlier decline. United Molasses have been active around 46s. 3d., but the 4s. units of the Distillers Co. turned easier at 19s. 3d. Associated Cement eased to 78s. 9d., Goodlass Wall to 38s. 9d. and British Plaster Board 5s. units were 14s. 3d.

British Oxygen, at 86s. 3d., showed firmness on the success of the new issue, but Dunlop Rubber came back to 51s. 7½d. British Aluminium at 38s. 3d. turned firmer after their recent decline. British

Glues 4s. units, at 22s., lost part of their rise. Levers, at 41s. 9d., rallied moderately. Among plastics, British Xylonite came back to 81s. 3d., De La Rue were 23s. 6d., British Industrial Plastics 2s. shares, 5s. 9d., and Kleemann, 9s. 9d. Tube Investments have been active again around £6½, awaiting the new issue terms.

Boots Drug, were lower at 48s. 6d. Beechams deferred, around 13s. 6d., and Borax Consolidated at 55s. 6d., were again a firm feature. United Glass Bottle at 77s. 6d., remained firmly held. British Celanese eased to 23s. 9d. although there is confidence that new capital, when required, is likely to be raised by an offer of additional shares to shareholders at attractive terms.

Oil shares were inclined to lose ground, although Anglo-Iranian at £5 15/16 regained part of an earlier decline. Shell were 65s., and Canadian Eagle rallied to 27s. 9d. on the success of the new issue.

Market Reports

STRONG price conditions with a persistent demand have characterised the industrial chemicals market for some months and the past week has been no exception. Buying for home and export continues at a good level and deliveries have been well maintained though a scarcity in available supplies is reported for some items. The shortage of drums is an additional handicap to prompt deliveries. Among the soda products, sodium sulphide is in steady request and chlorate of soda supplies are readily absorbed. There is no change in the potash chemicals all of which are firm on a keen demand. The effect of the restricted supply of sulphur on current supplies of sulphuric acid is becoming more evident and a reduction in output over a considerable period appears to be inevitable. Formaldehyde is firm on a good demand while acetone supplies are barely sufficient to satisfy requirement. The call for tartaric acid and cream of tartar remains good at the higher quotations now ruling. There has been no further change in the basis prices of the lead oxides and the demand continues on a good scale. Lead acetate and lead nitrate are being called for at the recently increased rates. An active demand with firm prices is reported on the coal tar products market with the naphthalenes in strong request. There has been

(continued at foot of following page)

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

AYLESBURY BATTERY & ELECTRICAL CO., LTD. (M., 9/12/50.) November 2, £2000 further charge (supplemental to a mortgage dated September 21, 1940) to Bucks Land & Building Co., Ltd.; charged on Sydenham House, 32 Havelock Street, Aylesbury. *£631. May 30, 1947.

Satisfactions

BRITISH DIESEL OIL & PETROL CO., LTD. (formerly L.T.C. DISTILLATES, LTD.), London, S.W. (M.S., 9/12/50.) Satisfaction November 7, of debenture registered April 4, 1938, to the extent of £6000.

YORKSHIRE DYEWARE & CHEMICAL CO., LTD., Leeds. (M.S., 9/12/50.) Satisfaction October 30, of amount outstanding July 1, 1908.

Release of Receivership

GRAFFENHALL CHEMICALS, LTD., 44 Brazennose Street, Manchester 2. E. C. Smith, of Faraday House, 17 Todd Street, Manchester 3, ceased to act as receiver on November 20, 1950.

Increases of Capital

The following increases of capital have been announced: CHEMICAL PLANT CO., LTD., from £1000 to £10,000; EBONITE CONTAINER CO., LTD., from £100,000 to £200,000.

Change of Name

The name of UNIVERSAL PROOFINGS, LTD., The Estate Office, Bromley Hill, Bromley, Kent, has been changed to L.D. PROCESSES, LTD.

Company News

United Kingdom Chemicals

Lord Brocket, chairman of United Kingdom Chemicals, announces that an agreement has been made with British Anthracite Sales, Ltd., for that company to acquire a 50 per cent interest in his company and United Carbon Black, Ltd. These companies, which jointly own a factory extending to some seven acres at Port Tennant, Swansea, have hitherto been privately financed. United Carbon Black, Ltd., is the first factory in Britain to have gone into production of carbon black.

New Registrations

Darcy Products, Ltd.

Private company. (488,672.) Capital £100. Importers, exporters, and dealers in chemical, oil and mineral products, etc. Directors: T. J. Clark, and G. M. Daintry. Reg. office: 175 Piccadilly, W.1.

Supra Chemicals and Paints, Ltd.

Private company. (488,890.) Capital £20,000. Manufacturers of and dealers in paints, colours, varnishes, lacquers, bituminous paints, enamels, etc. Directors: O. Green and P. Neal. Reg. office: 9/11 Hainge Road, Tividale, Tipton.

THE STOCK AND CHEMICAL MARKETS

continued from previous page

no easing in the demand for cresylic acid and the A.D.F. material is commanding as much as 9s. per gallon ex works.

MANCHESTER.—Textile and allied trades and other users of heavy chemicals are pressing for deliveries of a wide range of products, but growing scarcities of some chemicals have worsened the delivery position. During the past week a steady flow of new inquiries for alkali products, potash and ammonia compounds and miscellaneous chemicals has been reported. Buying interest on the part of the shippers has been maintained. Prices are firm in all sections and some fresh advances are anticipated. Most tar products continue to meet with a steady demand.

GLASGOW.—Business in the Scottish heavy chemical market has, in general, been steady. The export market has remained extremely quiet.

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PROPOSED SCIENCE CENTRE

Participating Societies

NAMES of the scientific societies which had agreed to co-operate in the proposed new Science Centre in London were revealed by Sir Robert Robinson, retiring president, in his address at the anniversary meeting of the Royal Society last week.

The societies which had agreed to participate were the Biochemical Society, the British Association, the Chemical Society, the Faraday Society, the Geological Society, the Linnean Society, the London Mathematical Society, the Physical Society, the Physiological Society, the Royal Anthropological Institute, the Royal Astronomical Society, the Royal Society, the Royal Statistical Society, and the Society of Chemical Industry.

Proposals for the centre were outlined by the Lord President of the Council in the House of Commons on November 21. Although at present the famous landmarks that might be visible from the centre could not be revealed, Sir Robert Robinson said that the concurrence of the Royal Society and other bodies had been given.

The quarters for the various societies would be separate, with their own entrances, very much as at Burlington House. The scientific societies would retain their individual libraries, together with any system of classification to which they attached importance. There would be a Central Scientific Reference Library based on the patent Office Library. This and other activities would be housed in separate buildings.

In conclusion, Sir Robert said that he had seen no sign whatever of any attempt or desire to undermine the independence of the Royal Society or to make it subservient in the smallest degree to any material or political interest.

Cost of New Sulphur Plant

In the article "Sulphur Supplies Endangered" (THE CHEMICAL AGE, 63, 737) the statement that . . . "the cost of producing sulphuric acid . . . in the case of pyrites . . . is about three times as great as by the conventional processes, while the anhydrite method costs about six times as much" is misleading. The figures actually relate to the capital expenditure involved in the installation of new plant to produce sulphuric acid by these processes, and not to actual production costs.

DANGER TO CHEMISTS

Professor Gives Warning

THE danger that Britain might attempt to emulate the U.S.A. in its application of chemistry to industry—and thereby limit the attention given to fundamental science—was stressed at this year's Ramsay Chemical Dinner in Glasgow. Speaking on "The Profession of Chemistry," Professor A. R. Todd, Professor of Organic Chemistry at Cambridge University, indicated that his own graduates were being well nigh torn to pieces by industrialists, anxious to employ qualified chemistry graduates.

He approved the trend, and welcomed the growth of the chemical industry which he anticipated would continue to expand. But Britain must not emulate the United States in applying chemistry to industry. Main strength of British development had lain in fundamental science. New discoveries had developed from that attitude and there was now a danger that Britain was sacrificing quality for quantity. He urged a revival of interest and attention to fundamental chemistry and science as the method whereby a world wide reputation for new discoveries might be retained.

Other speakers were Walter Elliot, M.P., Prof. E. K. Rideal, Prof. J. W. Cook, and Baillie A. Donald, representing the Lord Provost.

Release of Nuclear Data

The public release of certain information on low power research reactors has recently been agreed by the atomic energy authorities of Great Britain, Canada and the U.S.A. A Ministry of Supply publication just issued, indicates the new categories of information now being released, together with some details.

Of most general interest is that low energy thermal neutrons are captured in appreciable quantities by uranium-235, without causing fission. Previously available information indicated that practically all thermal neutrons captured by U^{235} would result in fission. Now, however, it is revealed that a significant fraction of all thermal neutrons colliding with U^{235} are captured to form U^{236} , a factor to be borne in mind by engineers designing uranium reactors.

Aluminium from Italy?

Stocks of aluminium in Italy are reported to be so satisfactory that producers have asked the Government to allow exports to be resumed.



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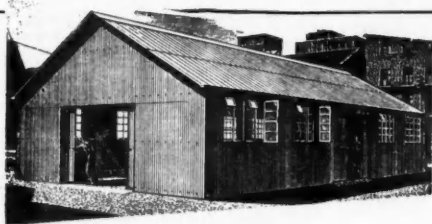
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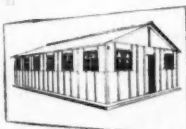
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No. 203 One DITTO by WERNER PFLEIDERER, with a C.I. built pan or mixing chamber, of the double "U" type, 4 ft. 5 in. long by 3 ft. 8 in. by 33 in. deep, with double "Z" mixing arms, gears at each end, hand-operated tilting gear, with steel backframe, counterbalancing weights and chains, and fast and loose pulleys 3 ft. diam. by 6 in. face.

No. 209 One HORIZONTAL "U"-SHAPED MIXER. steel built, riveted, measuring about 8 ft. 3 in. long by 3 ft. wide by 3 ft. 3 in. deep, with horizontal shaft, fitted with bolted-on mixing arms about 18 in. long by 4 in. wide, with intermediate breakers, and driven at one end by a pair of spur gears, with countershaft, fast and loose belt pulleys, outer bearing and plug cock type outlet at the opposite end, mounted on two cradles fitted to two R.S.J. running from end to end.

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Steam heated **DRYING OVEN** by **AIRSCREW**, continuous type, twin compartment 50 ft. long. Air circulation and heat control. 30/50 lb. W.P. 3,000 to 4,000 lbs. evaporation. Trolleys mechanically hauled.

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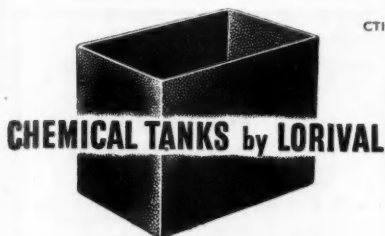
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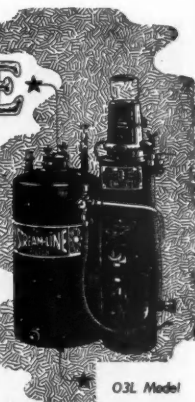
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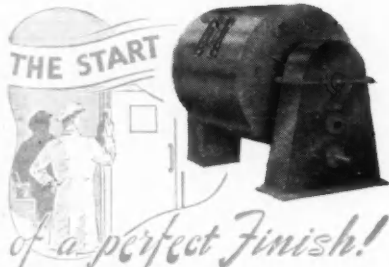
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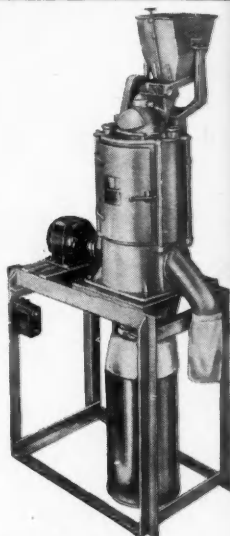
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